Transitions on triangles

In the condensed matter physics the triangular lattice with the spin at each corner is quite well known. It is an example of the phenomenon called *Geometrical frustration*. The phenomenon occurs as a consequence of the failure to simultaneously satisfy all the constraints imposed by the interactions between the neighbouring atoms. As the result the frustrated material can not freeze no matter how low the temperature is. The material on the quantum level consists of two phases: the ordered frozen phase and disordered quantum liquid phase. The quantum effects of the spin fluctuations are amplified because the model is two dimensional. Combined with the geometry aspects (like the reduced dimensionality) lead to an interesting phase diagram of the frustrated triangular antiferromagnet.

One could also add an external magnetic field to our considerations. Then it was shown that spin-liquid phase can be frozen and become ordered. The fields needed are about $14\,[\,m\,T\,]$. The scenario of such a transition is similar to that known from the theory of the Bose-Einstein condensation in super fluid helium. The spins are collectively condensed into long range ordered anti parallel configuration.