Wetting Transitions at Multiple Junctions of Interfaces

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The behavior of junctions of interfaces in multiphase fluid systems is examined in the vicinity of a perfect wetting transition in which one of the interfaces disappears because it becomes coated with a layer of a "wetting" phase. It is found that the wetting phase wets that interface at all the higher junctions involving that interface, almost always well before that interface disappears elsewhere. Unusual multiphase junctions, such as line junction of more than three phases, and point junctions of more that four phases can occur. The stability criteria for a line quadrijunction will be given. Unlike line triple junctions in which the equilibrium dihedral angles are fixed and determined by a balance of surface tension forces, line quadrijunctions can be stable for a range of angles that can be predicted from such a force balance. There is qualitative agreement with experiments in a number of systems.