

# **The map-likelihood function and improvement of phases in X-ray crystallography and general phase recovery**

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A likelihood-based approach to density modification in X-ray crystallography has been developed that can be applied to a wide variety of cases where some information about the electron density at various points in the unit cell is available. The key to the approach consists of developing likelihood functions that represent the probability that a particular value of electron density is consistent with prior expectations for the electron density at that point in the unit cell. These likelihood functions are then combined with likelihood functions based on experimental observations and with others containing any prior knowledge about structure factors to form a combined likelihood function for each structure factor. A simple and general approach to maximizing the combined likelihood function has been developed. The relationship between the likelihood-based approach and classical methods in general phase recovery will be discussed.