# Reconstruction algorithms behind the paradigm shift in microscopy

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Recent developments in the field loosely identified with the names "diffraction microscopy" and "diffractive imaging" have greatly expanded the means whereby spatial information can be collected using radiation. This shift from the traditional paradigm, where the apparatus forms the real image, was made possible largely by iterative reconstruction algorithms.

In the last few years, the difference map, a member of the iterative algorithms family, has been applied successfully to a variety of problems outside the imaging field. This tremendous broadening of possible applications suggests that a wide variety of new imaging methods can also benefit from this unified framework.

We will present the formalism, already implemented by various groups, based on constraint sets and projections onto them. This framework provides a powerful but natural way of translating into mathematical and algorithmic form the constraint applicable to the specimen and imaging system. The terminology also provides more rigor and precision for the description of reconstruction methods and for the evaluation of the physical interpretation of reconstructions. Through examples from simulations and experiments with an optical setup, we will show how one can go beyond the usual pair, of diffraction data and support, to accommodate various experimental conditions. We expect that this general formalism will encourage the exploration of new ideas.