MuscleX: Data analysis software for fiber diffraction from muscle and other fibrous protein systems.

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For many years, analysis of fiber diffraction patterns from muscle was a rate limiting step in the preparation of experimental results for publication. Most analysis procedures made extensive use of FIT2D supplemented by locally developed or commercial software tools which were not specifically designed for the task. Analyzing the data from a single experiment could take many weeks or months. To address this bottleneck, we have developed a comprehensive data reduction suite of programs which we call 'MuscleX". The software is open source under a modified BSD license. MacIntosh, Windows and linux installers permit easy deployment. The "Equator' routine can analyze the equatorial patterns from a complete experiment in a few hours without operator intervention, a process that used to take many months. The 'Quadrant-Fold" package averages the four quadrants of a diffraction pattern to improve signal to noise for more detailed analysis. It can also perform global background subtractions using either a "white top hat" real space digital filter algorithm, or a two-dimensional convex hull. It also includes radially symmetric, iterative smoothing and "roving window" background subtraction routines from the now defunct CCP software suite. Quadrant folding may be useful to remove the lines in the patterns created by the dead zones between modules in common pixel array detectors. Other components of the suite include "Projection Traces" and "Diffraction Centroids" that automatically analyze the intensity and spacings of prominent reflections on the meridian and layer lines from the large amount of diffraction images collected in time resolved experiments. Once the programs are set up, they can process an entire directory of data without operator intervention in a few hours. In this presentation we will discuss current capabilities and planned future developments and how the MuscleX package may be useful for all biological fiber diffraction experiments, not just muscle diffraction.