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3D Synthetic Aperture PIV of a Freely Swimming Fish LEAH MENDELSON, ALEXANDRA TECHET, Massachusetts Institute of Technology — Fish owe much of their locomotive success to complex body geometries and wake interactions that cannot be fully characterized by planar experimental techniques including 2D PIV. Volumetric methods are valuable to illustrate and quantify these features, thus providing new insights for bioinspired design. In particular, synthetic aperture particle image velocimetry (SAPIV) uses light field imaging algorithms to reconstruct a 3D particle field which can then be analyzed using a 3D cross-correlation. Previous studies have shown that this technique is able to resolve all three velocity components on the same order length scale and to see around partial occlusions, such as a caudal fin, through the use of multiple cameras. To harness these capabilities for biomimetic use, SAPIV is used to depict the three-dimensional velocity field and vortical structures surrounding a freely swimming Giant danio (*Devario aequipinnatus*) during straight swims and turning maneuvers.

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