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Interactions between butterfly scales and unsteady flows during flapping flight[1] ROBERT JONES, AMY LANG, University of Alabama — Recent research has shown that the highly flexible wings of butterflies in flapping flight develop vortices along their leading and trailing edges. Butterfly scales (approximately 100 microns) have a shingled pattern and extend into the boundary layer. These scales could play a part in controlling separation in this 3-dimensional complex flow field. Biomimetic applications of butterfly scales may aid in the development of flapping wing micro air vehicles. In this study, we observed that the orientation of the scales may relate to the local flow field, and might move or shift during flight. Monarch butterflies were trained to fly in a low speed smoke tunnel for visualization. Scales were removed from the leading and trailing edges and specimens were photographed at 500 frames per second. Variation in flapping pattern and flight fitness are discussed.

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