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# THE ASTROPHYSICAL JOURNAL LETTERS

## EVIDENCE OF FANNING IN THE OPHIUCHUS STREAM

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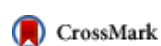
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## Abstract

The Ophiuchus stellar stream presents a dynamical puzzle: its old stellar populations ( $\sim 12$  Gyr) cannot be reconciled with (1) its orbit in a simple model for the Milky Way potential and (2) its short angular extent, both of which imply that the observed stream formed within the last  $< 1$  Gyr. Recent theoretical work has shown that streams on chaotic orbits may abruptly fan out near their apparent ends; stars in these fans are dispersed in both position and velocity and may be difficult to associate with the stream. Here we present the first evidence of such stream-fanning in the Ophiuchus stream, traced by four blue horizontal branch stars beyond the apparent end of the stream. These stars stand out from the background by their high velocities ( $v_{\text{los}} > 230 \text{ km s}^{-1}$ ) against  $\sim 40$  other stars: their velocities are comparable to those of the stream, but would be exceptional if they were unrelated halo stars. Their positions and velocities are, however, inconsistent with simple extrapolation of the observed cold, high-

density portion of the stream. These observations suggest that stream-fanning may be a real, observable effect and, therefore, that Ophiuchus may be on a chaotic orbit. They also show that the Ophiuchus stream is more extended and hence dynamically older than previously thought, easing the stellar population versus dynamical age tension.

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