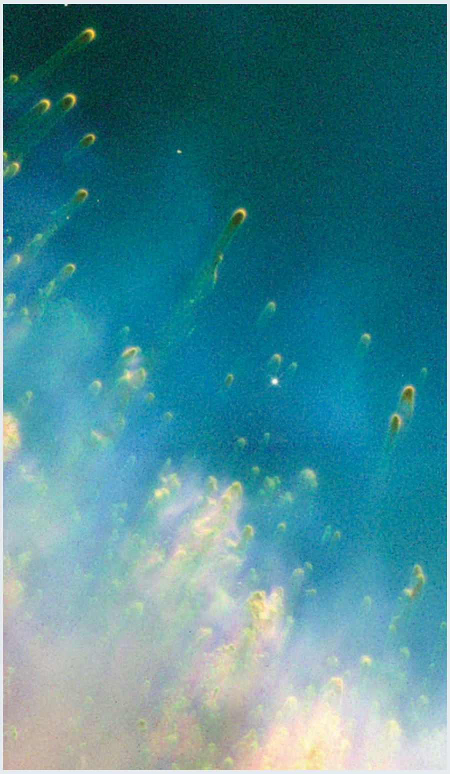
PUBLISHED: 1 AUGUST 2017 | VOLUME: 1 | ARTICLE NUMBER: 0201

QUASARS

Twinkle, twinkle massive galactic nucleus

Some quasars, the luminous and active nuclei of galaxies, are known to 'twinkle' at radio wavelengths in much the same way that stars twinkle visibly in our night sky. Light from these distant objects is altered on its passage to Earth by the intervening medium: in the case of stars, the visible light is perturbed by the motion of the Earth's atmosphere; in the case of quasars, the explanation has not been so clear cut — until now. Mark Walker and colleagues (*Astrophys. J.* **843,** 15; 2017) realized that at least two of the twinkling quasars had hot, bright stars close to their lines-of-sight to the Earth, and they suggest that it is the circumstellar environment of these coincident stars that is responsible for the twinkling effect (called radio scintillation). To affect the incident radio emission from the quasars, the material around the stars must be ionized, and through an analysis of the scintillation patterns, the material must be in elongated structures arranged radially around the star — perhaps very similar to the cometary globules seen in the Helix Nebula (pictured).



C. ROBERT O'DELL AND KERRY P. HANDRON (RICE UNIVERSITY), NASA

This research was triggered by an observing program of the Australia Telescope Compact Array called ATESE, designed to detect extreme scattering events (ESEs) that cause flux modulations and scattering angles more than those typically associated with the interstellar medium (known as interstellar scintillations). The observations are also sensitive to short-period, large-amplitude events (IDVs) like the twinkling described above. In the course of the program, the observers detected an IDV towards quasar PKS 1322-110 and then noticed its coincident star, Spica. Two further IDVs towards quasars have been studied on longer timescales (not as part of ATESE), and it is these that Walker *et al.* used to bolster their theory: PKS 1257-326 (with star Alhakim) and J1819+3845 (with Vega).

Despite the tantalizing nature of Walker *et al.*'s explanation, there is an issue with the analogy: the Helix Nebula is an evolved star that was previously surrounded by a clumpy circumstellar envelope. Vega and Alhakim are main-sequence stars and are not expected to be embedded in dense circumstellar media. Thus the origin of the plasma filaments in these cases is not clear; Walker *et al.* suggest that the globule-like structures are long-lived and formed contemporaneously with their stars. Alternatively they may be left-overs from an unconventional star formation process: molecular clumps that did not coalesce with others to form stars. Further study of the environments around these stars, for instance by imaging molecular emission lines of H_2 or CO, may help to cement the explanation behind these glittering galactic nuclei.

PAUL WOODS