Radio stars: A flurry of unheard-of activity in Algol

Early in the history of radio astronomy observers found that visible stars do not generally radiate intensely enough in the radio part of the spectrum to be recorded. None were found, and observations of the sun, a representative middle-sized star, indicated that ordinary single stars would be undetectable at several light-years distance.

Lately, however, five stellar sources of strong radio emanations have been discovered. They are Antares B (SN: 3/6/71, p. 165), beta Persei (Algol), beta Lyrae, and the X-ray sources Sco X-1 and Cygnus X-1. Discovery of Algol and beta Lyrae and the identification of the Cygnus X-1 radio source with the visible star HDE 226868 are reported in the Feb. 4 NATURE by C. M. Wade and R. M. Hjellming of the National Radio Astronomy Observatory.

None of the five would qualify as an ordinary middle-sized single star. Four are proven to be binary systems, and Sco X-1 is suspected of being a binary. Their radio emissions raise an astrophysical question to which no one yet has a very good answer: What is the mechanism that produces the radio waves?

Algol is the clearest case in point. Its spectrum does not fit the usual astrophysical sources, a hot thermal plasma or noncoherent synchrotron radiation. Some have suggested that the radiation might be coming from a very massive body, a white dwarf or a neutron star, that would be one of the components of the system being observed, but Hjellming says that certainly cannot be for Algol. Algol has been closely observed for a long time and there is just no room for an unknown white dwarf or neutron star in the system.

Probably the source mechanism has to do with the binary nature of these systems. Hjellming points out that the configuration of the gravitational field in a binary star system makes it relatively easy for streams of matter to be transferred from one component to another. Large amounts of matter falling onto the surface of one or both bodies at high velocities might somehow provide the emission mechanism. (Such activity might also produce X-rays in the cases where they appear.)

To add mystery to enigma the behavior of Algol, as it has been monitored over the last few months, has been unusually wild. Sudden changes in intensity amounting to several orders of magnitude have been repeatedly recorded. "We have no idea what's going on," says Hjellming. "Every day brings a surprise, a type of event that never happened before." (There is also some indication that Algol's optical output is going through unusual events too.)

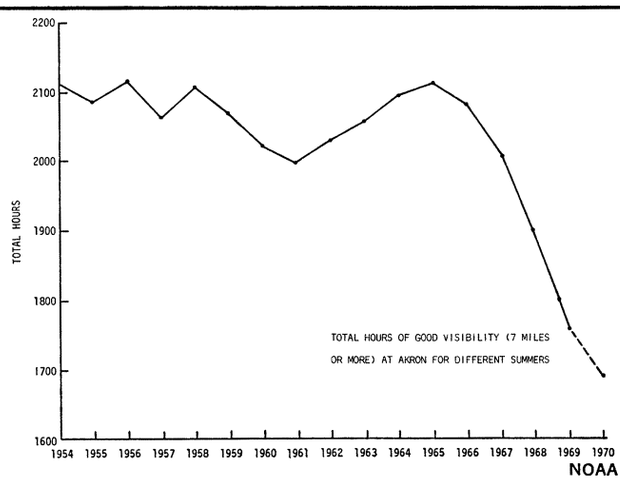
Binary stars are not uncommon. Yet in spite of Algol's flagrant behavior, searches of a large number failed to turn up any more detectable emissions. This leads Hjellming to suggest that star systems of this type go through long quiescent periods and then suddenly flare up. "Just by chance," he says, he and Wade happened to be looking when Algol was flaring up. The how and why of the phenomenon remain to be elucidated. "It's all absolutely unheard of," Hjellming concludes. □

Clarity of atmosphere: Rapid decline

Widespread conversion from coal to the cleaner-burning gas and oil fuels earlier this century resulted in noticeable improvements in air quality. Several studies showed improvements in visibility from about 1930 to the mid-1960's. Now, however, it appears that man has succeeded in reversing this trend. Over the past few years, aircraft pilots have been complaining of increasing navigation problems due to atmospheric haziness.

Prompted by such reports, M. E. Miller, N. L. Canfield and T. A. Ritter of the National Weather Service and C. R. Weaver of the Ohio Agricultural Research and Development Center have investigated recent visibility trends at three airports. They compared visibility measurements at airports near Akron, Ohio, Lexington, Ky., and Memphis, Tenn., for the period from 1962 to 1965 with measurements for the same locations for 1966 to 1969. They found that at all three locations visibility has become steadily worse; the number of occasions on which visibility was less than six miles was much greater during the 1966 to 1969 period than for the preceding four-year period. The frequency of observations of low visibility increased from 21.5 percent to 33.1 percent. Haziness, the researchers note, increased abruptly in 1966 and has continued to increase through 1970.

To determine whether these increases in haziness might be due to natural causes, the researchers made data corrections for those meteorological variables that contribute most to restricting visibility—high humidity and precipitation. They also corrected for wind and location effects. The frequency of reduced visibility still increased with time.



The researchers suggest in the January MONTHLY WEATHER REVIEW that the observed increase in atmospheric haziness must have resulted either from nonmeteorological natural additions to the atmosphere (such as from volcanic eruptions) or man-induced increases in particle content. Because they observed no substantial natural additions to the atmosphere during the period of study, the researchers conclude that the increased haziness must be due to manmade pollution.