Underhill, Anne B. The radial velocity variations of the shell star ζ Tauri.

Radial-velocity measurements of the hydrogen lines covering the period 1930 to 1952 are presented. It is shown that from 1930 to 1946 the observed variations in radial velocity were regular and can be described as binary motion. A least-squares solution was performed for this data and the following orbital elements were derived: $P = 132.91$ days (assumed), $T = 17.78 \pm 4.08$ days, $\omega = 318^\circ.51 \pm 12^\circ.32$, $e = 0.162 \pm 0.041$, $K = 8.92 \pm 0.57$ km/sec, $V_0 = +21.75 \pm 0.30$ km/sec, $a_1 \sin i = 1.608 \times 10^7$ km, $f(m) = 0.00940 \odot$.

The published radial velocities at other epochs are compared with this basic binary motion, and it is shown that there were significant deviations from simple binary motion in 1902-05, 1914, 1921, and in 1923-27. Pronounced random fluctuations in the radial velocity from the hydrogen lines took place during the observing season 1951-52. Also the hydrogen cores have changed in appearance, the lines being rather shallow and diffuse in 1950, but becoming sharper and deeper in 1951 and 1952. They now appear as they were in 1939. However, there has been no appreciable change in the metallic line spectrum since its enhancement in 1949.

The changes in the shell spectrum are secular in nature and do not vary with the radial-velocity period of 132.91 days. It is suggested that the outer shell in which the sharp hydrogen cores originate is rather a field of changing clouds or prominences than a quiescent body of gas, and that the sporadic radial-velocity fluctuations observed arise because from time to time different elements with differing radial velocities are in the line of sight.

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Williamson, Ralph E. Limitations in measuring the distribution of galactic radiation by radio telescopes.

Some of the properties of the one-dimensional form of the integral equation

$$P(\theta) = \int S(\theta')G(\theta' - \theta) d\theta'$$

connecting the power distribution $P(\theta)$ as observed by a radio telescope with an antenna pattern $G(\theta)$ with the true distribution $S(\theta)$ of the intensity of radio-frequency radiation have

been investigated theoretically and computationally at the David Dunlap Observatory, with financial aid from the Cornell University-U. S. Navy radio astronomy project.

Progress to date comes under two headings:

1. Irrespective of the method of arriving at an approximation for the function $S(\theta)$ from the known functions $G(\theta)$ and $P(\theta)$, there is a serious limitation on the amount of information obtainable about $S(\theta)$. It is possible to exhibit alternative forms of $S(\theta)$, which may differ in places by 20-50 per cent of the maximum value, and which still reproduce the observed power-distribution well within present-day observational errors—say one per cent. Under these circumstances, there is little hope of obtaining better than factor-of-two accuracy in the intensities of sources which are less than two-thirds the width of the antenna pattern.

2. A reduction procedure has been devised which produces rapid and accurate approximations to $S(\theta)$ from certain constants derived from the function $G(\theta)$ and from successive tabular values of $P(\theta)$. Extensive tests of the procedure have been carried out, using synthetic functions for $S(\theta)$ and $G(\theta)$, thence producing the expected $P(\theta)$, which can then be analyzed. Comparison of the new method with the iterative method of analysis (sometimes used for the solution of the analogous problem in line spectrophotometry), the only other systematic reduction technique in use, shows that the new method is more accurate, and some twenty times as fast.

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Wyatt, Stanley P., Jr. A radio model of the galaxy.

An analysis is carried out to determine the structure of the galaxy as it is defined by the intensity distribution of continuous radio emission at 100 mc/sec. Observational data are the radio isophotes of Bolton and Westfold. Results depend on the likely assumptions that the radio galaxy is axially symmetric and that it is transparent at 100 mc/sec.

The density function in the galactic plane turns out to be approximately Gaussian in character, with a fairly "flat" nucleus, the sharpest decay in the regions 2-4 kiloparsecs from the center, and a nearly linear decrease in the vicinity of the sun. The curve agrees with that found by Bolton and Westfold for the inner part of the galaxy.