Meeting Report:

STELLAR PULSATION
a Memorial to John P. Cox

August 11 - 15, 1986
Los Alamos, NM

Abstract

Highlights are presented from a meeting on Stellar Pulsation, held in Los Alamos in August, 1986, in memory of John P. Cox (1926-1984).

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John P. Cox (1926-1984) was perhaps the outstanding theorist of pulsating variable stars after Eddington. His work led among other things to our present understanding of the basic mechanisms of pulsation for Cepheids and related stars. He was also a quiet, possibly shy, and very kind person, whose encouragement was important to those of us who were fortunate enough to encounter him. This August about a hundred astronomers gathered in Los Alamos to remember John Cox in the most appropriate way by continuing the work he began. Our editor, Charles Whitney, opened the meeting with a review of John Cox's early career.

The meeting included scientists from around the world, established researchers as well as a number of graduate students. Sessions were organized around review lectures on subjects that John Cox wrote about: Cepheid pulsation, white dwarf oscillations, and so on. There were also social events; at the banquet, former colleagues, post-doctoral fellows, and students of John Cox shared reminiscences. Since John Cox enjoyed music, there was a very special concert featuring the Santa Fe Ensemble (flute, oboe, and harp).

From my notes I have selected some highlights of the meeting which should be of interest to AAVSO members:

Is Arcturus a variable star? A group from Arizona has developed equipment for measuring very small velocity variations; their purpose is to look for Doppler shifts in the spectrum resulting from the presence of a Jupiter-sized planet with an orbit of 3-10 years. No planets have been reported yet, but they had a bit of a surprise when they went to observe Arcturus: it showed regular velocity variations in a saw-tooth pattern with a period of about 2 days, suggesting some sort of pulsation or regular shock waves in the atmosphere. As instruments of increasing sensitivity are built, fewer stars can be considered truly constant.

Margarita Karovska, a young scientist currently at the Harvard-Smithsonian Center for Astrophysics, reported her deduction from a variety of observations that Betelgeuse is actually a triple system. The primary is the familiar red giant star, and is pulsating; the orbital periods of the two companions are about 2 and 60 years. The periods were deduced from a variety of measurements, including the AAVSO light curve for alpha Orionis.

Another paper reporting results from an analysis of AAVSO light curves was "The Case of Rho Cas," reported by Y. Sheffer of the University of Texas. A dominant "quasi-period" of 520 days was found from the light curve; spectroscopic features varying in phase with this cycle suggest that this is a radial pulsation mode. Conclusion: rho Cas is a supergiant that was originally about 40-45 solar masses, but

has lost about half of that. It is only about 5 million years old, and is on its way to extinction - probably as some sort of supernova.

How well do we understand the Cepheids? A quote from a recent **Astrophysical Journal** article by two prominent non-stellar astrophysicists, "Cepheid basic physics is well understood," stimulated considerable laughter after participants had listened to several papers raising questions or suggesting opposing solutions to some basic problems. N. Simon of Nebraska has been studying the properties of Cepheid light curves using Fourier series; he emphasized that there is enormous regularity and uniformity in the behavior of Cepheid light curves using Fourier series; he emphasized that there is enormous regularity and uniformity in the behavior of Cepheids that is not predicted by any of the current models. There has been a long-standing problem that evolutionary models predict one set of masses, and analyses of the pulsations another set. N. Evans and E. Bohm-Vitense gave two papers concerning the masses of Cepheids, reporting in part on work they have done in collaboration. However, N. Evans' results appear to favor the evolutionary scale, E. Bohm-Vitense's, the other set. One source of uncertainty is that one of the Cepheids studied, SU Cyg, is actually a triple system with the companion to the Cepheid being a close binary system; it is not yet clear what types of stars these companions are.

Major current problems in the theoretical study of variable stars include (1) the disagreement among different methods of determining the masses of Cepheids, mentioned above; (2) the inability of theorists to produce models pulsating in two modes simultaneously, while observers find many such objects; and (3) the failure of theoretical models to reproduce the limiting amplitudes and the shapes of the light curves of Cepheids and other variable stars. In two years there will be another meeting in Nebraska of the Pulsating Star community; perhaps some of these problems will be solved by then.

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