

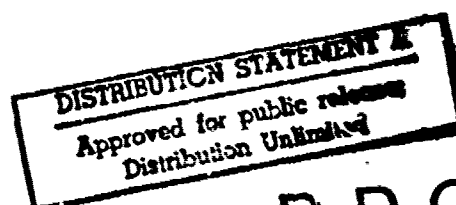
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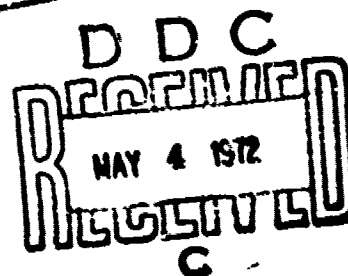
FINAL REPORT TO
OFFICE OF NAVAL RESEARCH
DEPARTMENT OF THE NAVY

ENERGY DISTRIBUTION IN STARS
Contract Nonr-2328(CO) NR 046-756



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William Liller
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FINAL REPORT OF PROGRESS
Contract Nonr-2328(00) NR 046-756

ENERGY DISTRIBUTION IN STARS

1 June 1957 to 31 May 1961

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The initial purpose of the project was to derive the physical conditions which exist in the atmosphere of a typical white dwarf star, specifically 40 Eridani B. In these model atmospheres, it has been assumed that there is only hydrogen and helium. The surface gravity was taken to be 10^7 and 10^8 (cgs units). Surface temperatures for the star ranged from $11,000^{\circ}$ K to $35,000^{\circ}$ K.

The combination of composition, surface gravity, and surface temperature then permitted calculations to be made of the physical conditions in the atmosphere of a hypothetical star not differing greatly in characteristics from 40 Eridani B. Also calculated was the emergent radiation flux as a function of wavelength for each of the various model atmospheres.

A total of ninety model atmospheres were derived. The first eight were computed by graduate students at The University of Michigan using desk calculators. These eight and an additional eighty-two atmospheres were calculated by Mr. Robert Tull using the IBM 704 digital computer of The University of Michigan Computing Center. Each model was for a star of differing composition, surface temperature, or surface gravity. The emergent fluxes from these stars were then compared with the emergent flux observed by the principal investigator while at the Mount Wilson Observatory during the summer of 1956.

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It was hoped that the model atmosphere with physical conditions most nearly matching those in the atmosphere of 40 Eridani B could be chosen unambiguously. However, the results showed that there was indeed a family of model atmospheres approximately ten in number - any one of which duplicates the emergent flux of 40 Eridani B.

Subsequent calculations will attempt to eliminate this ambiguity by comparing the shape and size of absorption lines in the spectrum of 40 Eridani B with calculated line shapes in each of the ten atmospheres.