(α,n) reactions occur are at most 100 times as abundant as the iron-group nuclei. It is also interesting to note that this value of n_c is adequate to produce the observed Pb abundance without appreciable cycling among the Pb isotopes having occurred.

Also from the calculations of Clayton *et al.* (1961), for $kT \sim 30$ keV, we can approximate $n_c \sim 80\ \tau^{1.5}$ over the range $0 < \tau \leq 1.35$, in which case the exposure distribution can be expressed as

$$g(n_c) = \rho(\tau)\frac{d\tau}{dn_c} \sim \left(\frac{n_c}{40}\right)^{-2.5}, \qquad 0 < n_c \leq 125. \tag{2}$$

Equations (1) and (2) can be used as empirical laws giving a good representation of the solar-system *s*-process abundances. In particular, form (2) will be independent of the neutron temperature. Integrals over $\rho(\tau)$ or $g(n_c)$ indicate that 10^{-3} of the iron-group nuclei ($N = 6.4 \times 10^5$ for Si $= 10^6$) have been exposed over the range $0.15 \leq \tau \leq 1.35$ or $5 \leq n_c \leq 125$. The divergence in integrations extended to $\tau = n_c = 0$ is not physically significant.

PHILIP A. SEEGER
WILLIAM A. FOWLER

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LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
AND
CALIFORNIA INSTITUTE OF TECHNOLOGY

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RECENT CHANGES IN THE SPECTRUM OF HR 8164 (BOSS 5481 A)*

Boss 5481 A (HR 8164) shows a composite spectrum combining a supergiant M star and a B star; emission lines of hydrogen (principally Hα) and [Fe II] are also prominent. The over-all spectrum resembles VV Cephei. Unlike VV Cephei, however, absorption lines of He I and H from the blue component are clearly visible shortward of Hδ. At longer wavelengths the M star dominates the spectrum. The spectral type of the blue component is very near to B2 V.

McLaughlin has noted in Bidelman's "Catalogue and Bibliography of Emission-Line Stars of Types Later than B" (1954) that no certain changes occurred in the spectrum between 1933 and 1952. Cassegrain spectrograms obtained at McDonald Observatory with the 500-mm camera and quartz prisms over the past 2 years reveal the gradual appearance of an ultraviolet shell-type absorption spectrum.

In March, 1964, the ultraviolet region showed very broad, hazy hydrogen lines (which were too weak to be detected beyond H15), rotationally broadened helium lines, and a few very faint lines of Cr II (multiplet 3) near λ 3400. In contrast several spectra obtained in October, 1965, show the Cr II lines greatly strengthened with many more multiplets represented, plus moderate intensity lines of Ti II, Mn II, and Ni II all at wavelengths shorter than 3800 Å. In addition, sharp, redward-displaced absorption cores are superimposed on the previously broad hydrogen lines. Table 1 lists the ions and mul-

* *Contributions from the McDonald Observatory, University of Texas,* No 406.