dition to providing a higher-intensity source and greater angular resolution for spectrographic solar astronomy, particle and magnetic measurements conducted from a close-in solar observatory may answer many of the questions concerning energy transfer in the solar atmosphere. Important experimental indices of solar activity on the temporarily hidden portions of the sun can be monitored and relayed to terrestrial observers. This information will be important to the solar physicist in general, but even more so to the scientific organizations attempting to determine periods of relatively safe manned space operations from observed solar conditions.

The paper discusses the following major items: (1) Possible scientific data to be returned from the near solar environment and the merits of the satellite as a base for experimental operations. (2) Parametric analysis of the information rate and bandwidth as a function of the size, weight, and environmental control of the solar observatory. (3) Discussion of typical launch vehicles and a brief analysis of optimization procedures as affected by the desired solar trajectory.

The paper also indicates some problem areas inherent in a system of this kind and suggests an approach to the successful application of the nuclear rocket to this solar mission.

A Theoretical Model for the Lunar Surface.

WARREN C. TYLER AND J. COPELAND, *Army Rocket and Guided Missile Agency, U. S. Army Ordnance Missile Command*.—The model assumes a homogeneous surface material with temperature-dependent thermal properties. A solution of the heat conduction equation applied to the lunar surface utilizing this model indicates more reasonable values of the thermal parameters of the lunar surface material than those required by previous theories. In particular, it is shown that a stratified lunar surface is not required to account for the observed infrared temperature measurements.

The effect of the slight ellipticity of the lunar orbit on the theoretical surface temperatures has been investigated. The results show an effect which must be taken into account for comparison with accurate infrared measurements.

Spectroscopic Observations of Some WC Stars.

ANNE B. UNDERHILL, *Dominion Astrophysical Observatory*.—Spectrograms of HD 192641 (46 A/mm at $H\alpha$, obtained in September 1961 show a typical Be shell star $H\alpha$ emission feature with absorption core superimposed on the WC7 spectrum. A spectrogram (30 A/mm at $H\gamma$) obtained in October 1961 shows a weak absorption core at $H\beta$ superimposed on a

faint, diffuse emission feature. No absorption cores are visible at $H\gamma$ or $H\delta$, though there is weak evidence for HeI $\lambda 6678$ and $\lambda 5876$ in absorption. It seems probable that HD 192641 is a binary, one component being a shell star. A Be-type hydrogen line at $H\beta$ may be seen on a few of the low-dispersion spectrograms which were obtained at Victoria between 1922 and 1944.

The profile of the blended CIV emission feature $\lambda\lambda 5801-5812$ has been examined on spectrograms (30 A/mm at $\lambda 5800$) of HD 192103, WC7, HD 192641, WC7+Be, and HD 193793, WC6+O. The profile is asymmetrical, the short-wavelength wing having a distinct shoulder while the long-wavelength wing is smooth. It is suggested that the shoulder is caused by violet-displaced CIV absorption lines. The velocity of expansion determined from the shoulder is the same for each star as that determined from the violet-displaced absorption lines due to HeI and from the width of the flat-topped emission line $CIII$ $\lambda 5696$. The presence of these CIV absorption lines from normal levels, points to a strong concentration of C^{3+} ions in the expanding shells of HD 192103, HD 192641, and HD 193793.

The spectrum of HD 193793 has been examined from $\lambda 3100$ to $\lambda 6800$. Diffuse, violet-displaced absorption lines due to HeI $\lambda 3187$ and $\lambda 3888$ are found. The resulting velocity of expansion is near 3000 km/sec in agreement with that deduced from the width of the $CIII$ $\lambda 5696$ emission and from identifying the absorption dip at $\lambda 5828$ as violet-displaced HeI $\lambda 5876$. HD 193793 has been ejecting material steadily at about 3000 km/sec for at least 30 years.

The Color of the Moon. SIDNEY VAN DEN BERGH, *David Dunlap Observatory*.—See this issue, p. 147, for complete article.

Nucleogenesis Clues Derived from the Composition of G Dwarfs. GEORGE WALLERSTEIN, *University of California*.—The abundances of 11 elements in 34 G dwarfs have been determined from 15 A/mm spectrograms in the yellow region. When the stars are compared to the sun it is found that the ratio of the metals to hydrogen varies from twice the solar value to 1/100 of the solar value. The relative abundances of the metals do not remain constant, in particular: (1) All metal-poor stars and a few normal stars show a deficiency of manganese with respect to the other iron-peak elements, chromium, nickel, and iron. (2) Seven stars show an excess of Mg , Si , Ca , and Ti with respect to the iron-peak elements as well as to the other light elements, Na and Sc . The four elements that appear in excess are all formed by the addition of successive α particles