Sources. C. J. WADDINGTON, *University of Minnesota*.—Measurements are currently being made in this laboratory by Mathiesen, Long, Freier, and Waddington with the objective of determining the relative abundances of the energetic nuclei of individual elements in the primary cosmic radiation heavier than phosphorous. This paper attempts to assess the relevance of the observed charge distribution to the problem of the nature of the sources of the cosmic radiation. The elements in the charge range between sulfur and nickel have the unique feature that there is no appreciable abundance of still heavier nuclei in the cosmic ray beam, and, as a consequence, it seems possible to deduce the source abundances from the observations. In order to make such a deduction, it is necessary to allow for the effects produced on the nuclei by passage through an amount of interstellar matter that is, for these nuclei, of the order of one interaction mean free path thick. This has been done by using the recently improved mass spallation equation derived by Rudstam (*Z. Naturforsch.* **21a**, 1027, 1966) to calculate individual element fragmentation parameters for iron and calcium nuclei producing fragments in the charge range between manganese or potassium and sulfur. With these fragmentation parameters, it is then possible to compare the observed spectrum with those predicted by the various tables of "cosmological" abundances, after passage through several amounts of interstellar matter.

It is found that the spectrum predicted for a pure iron source after passage through 4 g/cm^2 resembles the observed cosmic ray charge distribution. The source region thus appears to have no appreciable abundance of the cosmically abundant elements, sulfur, argon, or calcium and has a pure iron-nickel composition. Nickel appears with about the expected frequency relative to iron and is certainly not overabundant, suggesting that little element building above iron can have occurred in the source. It is also noted that relative to the lighter elements such as carbon and oxygen, these heavy elements are from two to twenty times more abundant in the cosmic radiation than they are in the cosmological abundances, even when no allowance is made for nuclear absorption in the 4 g/cm^2 of matter.

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Variation in the Solar X-Ray Line Spectrum below $25 \text{ \AA}$. A. B. C. WALKER, JR., AND H. R. RUGGE, *Aerospace Corporation*.—A solar-pointed scanning Bragg-type crystal spectrometer flown aboard the satellite 1966-111B made high-resolution measurements of the solar spectrum between 9 and $25 \text{ \AA}$ from mid-December 1966 to early March 1967.

The basic instrumentation consisted of a potassium acid phthalate ($2d = 26.6 \text{ \AA}$) crystal, a photoelectric detector and scaler. The scaler was sampled every $\frac{1}{2}$ sec which permitted a spectral resolution of $0.15 \text{ \AA}$ or a spatial resolution for small discrete sources on the disk of 15 min of arc.

The major lines observed at all times were due to the ions N VII, O VII, O VIII, Fe XVII, Ne IX, Ne X, and Mg XI. The lines with lower ionization potentials (N VII, O VII) appear to come from the whole disk while some of the lines with higher ionization potentials appear to come from several discrete sources. Long-term variations of intensity by a factor of 2 have been seen in several lines during the life of the satellite. Considerable hardening of the spectrum as well as larger intensity changes in the lines with higher ionization potential have also been observed shortly after the start of a large flare. Spectra for several conditions of solar activity are compared.

Some Additional Shock-Tube Absolute gf Values of Cr I and Cr II. GORDON W. WARES, *Air Force Cambridge Research Laboratories*, AND S. J. WOLNIK, R. O. BERTHEL, AND E. H. CARNEVALE, *Parametrics, Inc.*.—Both the previously reported and some new absolute gf values determined for Cr I by measurement of visible emission from known test gas mixtures of neon and a trace of $\text{Cr}(\text{CO})_6$ (chromium carbonyl) shock-heated to $6600\text{--}7200^\circ\text{K}$ were extended to 5900°K , and to fainter lines. The latter lines have greater weight in determining solar chromium abundance. No significant temperature effect was found even though the ratio of Cr I to Cr II increased several-fold. The vapor pressure curve of $\text{Cr}(\text{CO})_6$ was determined using a capacitance-type manometer. Vapor pressures were found approximately 10% lower than reported values. In the temperature range used, 10% lower vapor pressure corresponds to about 20% higher gf values. As a check on possible systematic errors inherent in photographic spectrophotometry, which has been used by ourselves and previous workers, gf values were determined simultaneously by photomultiplier-monochromator as well as by photography in a considerable number of cases that included both high and low excitation potential. Agreement was within 10%. Gas kinetic temperatures in the steady state region behind the reflected shock were routinely measured directly by an ultrasonic method on every shot. Independent spectroscopic measurements support the assumptions of LTE and optical thinness. Species concentrations were computed by an IBM 7094 iterative process, which accounted for energy depletion due to ionization and dissociation of the $\text{Cr}(\text{CO})_6$. The much discussed increase