Overabundance of Very Heavy Nuclei Accelerated in Solar Flares. A. MOGRO-CAMPERO and J. A. SIMPSON, Enrico Fermi Institute, University of Chicago. - The abundance relative to oxygen of the nuclei C, N, Ne, Mg, Si, S, A, Ca, and Fe-group (V-Co) have been measured in the energy range 14 – 60 MeV per nucleon for a sum of several solar flares. The measurements were performed with a solid state detector telescope on the GOO 5 satellite. Preliminary results have been recently reported (A. Mogro-Campero and J. A. Simpson 1972, Astrophys. J. Letters, 171, L5). We now report the results of additional analysis including new data and information on the arrival times of heavy nuclei for the individual flares. We show that the arrival times of the heavy nuclei correspond to periods of high-speed individual flares. By using a revised set of observation periods, we reach the same conclusions reported previously: (a) the differential energy spectra of O (14-29 MeV per nucleon) and the Fe-group (6-60 MeV per nucleon) have spectral indices of -3 for power laws in kinetic energy, and (b) the abundances of C, N, and Ne are in agreement both with solar spectroscopic data and with nuclear emission studies; however, compared with solar photospheric values we find an overabundance of most of the heavier nuclei, starting with Mg and extending up to the Fe-group. This research was supported in part by the NASA grant NGL 14-001-006 and Contract NAS 5-9366, and by the NSF grant CA-28385X.

Properties of a Coronal "Hole" from EUV Observations. R. H. MUNRO and G. L. WITHBROE, Harvard College Observatory. - A coronal hole is characterized by a significant deficiency in the intensity of coronal emission lines, yet there is little change in lines and continua formed below 800,000 K except for the He I and II emission features. Comparison of the hole with the normal quiet sun indicates that the electron density is reduced by a factor of three, the coronal temperature is lower by 600,000 K, and the temperature gradient in the chromospheric-coronal transition layer is less steep by an order of magnitude. The apparent insensitivity of the lines formed in the transition layer to the physical conditions of the hole imply that the conductive flux from the corona is proportional to the square of the electron pressure.

A Mechanism for Exploding Solar Granules. STEVEN NUSMAN, Sacramento Peak Observatory, Air Force Cambridge Research Laboratories. - I suggest that the exploding granule phenomenon is a consequence of the observed internal granular motions and the conservation of angular momentum. When a granule rising from the convection zone penetrates into the overlying stable region it is stretched horizontally. Conservation of angular momentum in the internal motions changes its form into a vortex ring. A model of this phenomenon occurring in a laboratory simulation will be shown. Also a numerical calculation with the same result will be described.

Spectrum Synthesis and the Solar Abundance of Gallium. J. F. MUTCHLER, Indiana University - Observations of the Ga line at 4172 Å in the sun were obtained at H = 1, 0.4, 0.2 using the McMath solar telescope of the Kitt Peak National Observatory. The observations have been subjected to analysis using a spectral synthesis procedure. In addition to providing a solar abundance for Ga, the analysis provides an example of the utility of the synthesis technique for refinement of such parameters as line broadening and turbulence. The observations at several H values permit additional criteria to be used for the optimization of the parameters and for the possible detection of unidentified perturbing lines. The abundance determined at H = 1 is log N(Ga) = 2.83 on the usual log N(H) = 12 scale. However, the center-to-limb observations indicate a strong selective discrepancy in the Ga line in the sense that the profiles predicted with this abundance are progressively too strong toward the limb. The probable explanation for the discrepancy seems to be non-LTE effects in the Ga line formation and this possibility is being investigated. As a result the Ga abundance may be in error. It is concluded that the use of center-to-limb observations are crucial in the determination of abundances for elements such as Ga with few usable lines which may be subject to strong non-LTE effects.

Energy Spectral Analyses of Small Scale Solar Magnetic Fields. T. NAKAGAMA, High Altitude Observatory, National Center for Atmospheric Research. The energy spectra of small scale solar magnetic fields are obtained by applying horizontal Fourier analyses to the longitudinal magnetograms of the Kitt Peak National Observatory for typical active and quiet regions and to that of the Sacramento Peak Observatory for a mixed region. It is shown that the observed energy spectra can be interpreted in terms of the two-dimensional response of the local magnetic fields to an isotropic turbulent convective motion. Implications of the results and the differences for different activities are discussed.

Observations of the Solar Corona Using Extreme Ultraviolet and X-Ray Spectroheliographs on the OSO-7 Satellite. W. M. HORTON, J. H. UNDERWOOD, and R. J. THOMAS, Solar Plasma Branch, Laboratory for Solar Physics, NASA-Goddard Space Flight Center, Greenbelt, Md. - OSO-7 (now at Aerospace Corp., Los Angeles, Calif.) Instrumentation on the OSO-7 spacecraft, launched September 29, 1971, is being used to study the spatial distribution of solar radiation having wavelengths between 0.81 and 400 Å. An EUV spectroheliograph provides a 10 x 20 arc sec field of view and two x-ray spectroheliographs each have fields of view 20 arc sec square. Four spectroheliographs at selectable wavelengths are made simultaneously by moving the entire instrument over the sun's disk and inner corona in a raster pattern. Observations made in consecutive stages of iron and magnesium show that enhanced electron temperatures associated with active regions extend at least 1 M above the limb. An apparent drop in electron temperature in the polar regions, as compared to equatorial latitudes is inferred from the reduced emission from high stages of ionization at the poles. Active regions show significant differences in structure in various emission lines depending on the temperature of formation of the line. In at least one instance the region of soft x-ray emission is a narrow band 60,000 km long situated between two areas of bright chromospheric plage.

EUV Spectra of Prominences and Filaments. R. W. NOYES, Smithsonian and Harvard Observatories. - EUV spectra of quiescent prominences show enhanced emission for lines formed at T < 3 x 10 ^ 5 K; above that temperature the emission decreases rapidly, and for T > 7 x 10 ^ 5 K the emission at the location of the prominence is less than that of the quiet corona. The temperature of the cold parts of prominences is found from the Lyman continuum spectrum to be T ~ 6800 K. The hydrogen ground-state departure coefficient is of order unity, as would be