expected for solar particles. At energies below 8 MeV/nuc further structure is observed in the energy spectra of all components which may be of solar origin. The simplest explanation of this selective increase of N and O is that at these low energies a different type of cosmic ray source is being sampled. The implications of this will be discussed.

H.3 Charge Composition and Energy Spectra of Cosmic Ray Nuclei. E. JULIUSSON, and P. MEYER, U. Chicago

H.4 Changing Composition of Cosmic Ray Primaries in the TeV Energy Range. P. KOTZER, Fairhaven College; S.N. ANDERSON, J.R. FLORIAN, L.D. KIRKPATRICK, J.J. LORD and J.W. MARTIN, University of Washington.---We will present nuclear emulsion data in which the primary cosmic ray and its interaction products with detector nuclei can be observed. Direct viewing of the event, and angular distribution measurements can be used to estimate the energy of the primary cosmic ray. The I.C.E.F.[2] data will be compared to the work of other investigators[1,3,4,5]. The emulsion data appear to support the Grigorov results which show a knee in the energy spectrum around one Tev/nucleon.

Submitted by PETER KOTZER

1. Naugle and Freier, Phys. Rev. 104-1956.
2. Koshiba et al Nuovo Cimento Supp. V.I. 1091 (1963).
3. Grigorov et al Proc. 12th Int. Conf. on Cosmic Rays 1752 (1971).
4. R.L. Golden Private communication.
5. P.B. Price et al Phys. Rev. Letters 31 #2 (1973).

H.5 Skylab Experiment S228: Transuranic Cosmic Rays. E. K. SHIRK and P. B. PRICE, Dept. of Physics, Univ. of Calif., Berkeley, Ca. 94720

H.6

Cosmic Ray Antiprotons and Related Astrophysics, G. D. Badhwar, R. L. Golden, and J. L. Lacy, NASA-Johnson Space Center, Houston, Texas 77058.

H.7 Is There a Case for Anisotropy of the Highest Energy Cosmic Rays? JOHN LINSLEY, Univ. of New Mexico.

I.1 Inverse Compton Radiation and the Magnetic Field in Clusters of Galaxies. D.E. Harris & W. Romanishin, Harvard College Obs. - Radio observations below 200 MHz are reported for the cluster Abell 401. These data together with UHURU X-ray measurements and relevant data for other clusters of galaxies are interpreted in terms of an ensemble of relativistic electrons producing radio emission by the synchrotron process and X-rays by the inverse Compton process. Formulas are presented which relate the observations to the relativistic electron spectra: magnetic fields of 10^{-7} to 10^{-8} gauss and total energies of 10^{62} to 10^{63} ergs are required. We believe that the critical test of the inverse Compton model will come from X-ray observations between 10 and 100 keV and have calculated X-ray intensities predicted for these energies.

I.2 Intergalactic Matter in Clusters of Galaxies. GEORGE B. FIELD, Center for Astrophysics. - Recent 2-8 keV observations demonstrate that many rich clusters of galaxies are X-ray sources. The simplest interpretation is bremsstrahlung from hot intracluster gas. Although such gas in rich clusters cannot itself contribute substantially to Ω, indirect arguments based upon its existence suggest that Ω due to all intergalactic gas must be small (Gunn and Gott), or may be large (Silk and Tarter). These and other arguments are reviewed and it is concluded that $\Omega \simeq 1$ is consistent with, but not proven by, the data.

I.4 Deuterium Formation Hypothesis for the Diffuse Gamma-Ray Excess at 1 MeV. M. LEVENTHAL, Bell Labs, Murray Hill, N. J.--Many measurements of the diffuse X-ray and γ-ray background indicate that it consists of an inverse power law spectrum with index $\sim$2.0. Spectral features or excesses are reported in the vicinity of 40 KeV and 1 MeV. In this paper a new explanation is presented for the 1 MeV excess. It is hypothesized that the peak arises from the astrophysical production of deuterium in all the galaxies by the two body recombination process ($p+n \rightarrow D+2.2$ MeV γ-ray) in an environment transparent to the emitted γ-rays. Employing the recently published Apollo 15 data[1] the hypothesis is shown to lead unambiguously to two remarkable numerical results. Namely a calculation of the terrestial n(D)/n(H) ratio and a prediction of quasar cutoffs at Z $\sim$ 3.

[1]J. J. Trombka, et.al. Ap. J. 181, 737 (1973).

I.5 The Importance of Spallation Induced Radioactivity For X- and Gamma-Ray Astronomy. C. S. DYER*, GSFC - Radioactivity induced in detector materials by cosmic rays and trapped protons is a major source of background, and sets severe limitations on present techniques in x- and gamma-ray astronomy for the range from 20 keV to 10 MeV. A system for prediction of such background is under investigation utilising the best available spallation cross-section data and Monte Carlo computations of the energy loss spectra of radioactive nuclides in detector materials. Preliminary results of such computations are presented for alkali halide crystals, and the accuracy of available cross-sections for these materials is assessed by comparison with monoenergetic proton beam irradiation results. A parallel investigation utilising experimental irradiation results to predict the spectra and time variations of induced activity is underway and preliminary results are compared with observations made with the OSO-5 hard x-ray telescope. The extent to which such techniques can be used to provide more reliable corrections for diffuse cosmic gamma-ray data from both the OSO series and the Apollo missions is assessed. Simple considerations imply that induced radioactivity will provide comparable problems in solid state devices and in proportional counters when used in the range above 20 keV. Optimisation of detector design and location should include allowance for this phenomenon. Collimated instruments operating in the range < 200 keV gain enormously if located in low altitude equatorial orbits. In view of the dependence of this and other backgrounds on detector and spacecraft mass, a radically different approach utilising light-weight systems in interplanetary space is suggested for the range 200 keV to 20 MeV.

*NAS-NRC Resident Research Associate