33.08
First Measurement of Magnetic Fields on a BY Draconis
Flare Star: EQ Virginis
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NSF) and J. M. Beckers (MT10 and KPO)
This paper reports the first unambiguous detection of photospheric magnetic fields on a BY Dra-type star. Application of a new iterative Zeeman profile analysis procedure, which includes radiative transfer effects, to high resolution, high signal-to-noise line profiles obtained with the Multiple Mirror Telescope yields a mean field strength of ~0000 gauss covering ~90% of the visible stellar surface of EQ Vir. This field strength is consistent with the equipartition of magnetic and thermal energy densities in the photosphere, but is smaller than predicted theoretically. EQ Vir's magnetic parameters can be compared to those of 61 Cyg A, a nonflare star of the same spectral type, which has a similar field strength, but a surface area filling factor only half as large. We discuss the implications of these results in the context of proposed heating mechanisms for flare star chromospheres and coronae and for various stellar activity theories. Observations reported here used the Multiple Mirror Telescope, a joint facility of the University of Arizona and the Smithsonian Institution. This research is supported by NASA grant NGL-06-003-057 to the University of Colorado.

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34.01
The Goddard Compton Telescope
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C. Fichtel, D. Kniffen, J. Trombka (NASA/GSFC)
A new balloon-borne γ-ray telescope is currently under development at the NASA/GSFC. Based on the Compton coincidence principle, it is intended for the study of point sources of cosmic γ-rays in the energy range \( \gamma \) 1 MeV to 30 MeV. The telescope design incorporates several features aimed at improving instrument performance over previous experiments of this type. Most important, these emphasize maximum rejection of the background events normally associated with observations in this energy regime. Background reduction techniques include: semi-active lead/plastic scintillator shielding, pulse-shape discrimination, time-of-flight measurements and Anger camera operation in the NaI detector assembly. A rocking collimator will permit greater angular resolution by providing field-of-view definition, as well as background subtraction via \( \gamma \)-OFF source observations. The instrument will be described, its current status reviewed, and objectives of the first balloon flight briefly outlined.

34.02
The MIT Prototype Gravitational Wave Detector:
A Status Report
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D.H. Shoemaker (MPF für Astro.)
In order to develop laser-illuminated Michelson interferometers suitable for gravitational wave detection a small (1.5 m arm length) prototype has been constructed. At low frequencies the interferometer output is dominated by seismic and acoustic motions of its masses. However at high frequencies (above 3 kHz) noise sources more fundamentally associated with the instrument appear above the theoretical laser shot noise floor. Among these are laser phase and amplitude noise and noise due to scattered light from the optical elements. Scattered light noise has been effectively reduced through the technique of applying external broadband phase modulation to the laser beam. This shortens the coherence length of the laser and causes scattered light to appear incoherent with respect to the main beams. Present sensitivities of \( 3 \times 10^{-14} \text{cm/sqrt(Hz)} \) are within a factor of six of shot noise limited performance. Effort is now going into understanding this remaining noise, which is thought to be due to the external phase modulation acting in concert with a path length difference between the arms. Understanding these noise sources will lead to the design of detectors capable of producing astronomically interesting observations.

34.03
A Novel Interferometer Using SIS Mixers
P. T. Timble and D. T. Wilkinson (Princeton U.)
Measurements of anisotropy in the 2.7 K background radiation are receiver noise limited. We describe a low noise, broad band microwave receiver designed to search for anisotropy in this radiation near 46 GHz at medium angular scales. The receiver contains two identical SIS (superconducting quasiparticle tunnel junction) mixer diodes arranged as an interferometer. The antenna size and separation yield a beam pattern which effectively compares the background in two spots 2° apart. Each separate receiver has a system noise of 55 K (888) over an instantaneous bandwidth of 500 MHz and can be tuned over most of our waveguide band. The interferometer should have similar sensitivity.

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34.04
A New UHF Antenna for IPS and Pulsar Observations
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(U.Calif., San Diego)
Since 1972 the solar wind group at UCSD has been carrying out observations of interplanetary scintillations at a VHF frequency of 73.8 MHz using three spaced antennas. Recently we have replaced one of these antennas with a larger one. This new antenna consists of 1024 full wave dipoles covering an area of 65m x 120m. Eight dipoles are connected in parallel with a transmission line to make a basic element. The antenna consists of 32 rows of 4 elements each. Each element is connected to a low noise amplifier and a 7-bit phase shifter. A total of 128 phase shifter steer an antenna beam in a field of view of \( \pm 30^\circ \) in N-S and \( \pm 17^\circ \) in E-W around the zenith. This antenna is equipped with a phase and gain measuring system for calibration. All necessary electrical power to operate the antenna system is supplied by solar panels. The antenna has an effective area of 5600 m² and an antenna temperature of 1000K. The net efficiency is 2.7 times better than that of the old antennas. The old IPS system can regularly observe more than 8 sources, and twenty sources when interplanetary disturbance occurs. We expect more than 35 sources to be observed regularly with the new antenna, and approximately 100 sources at the time of interplanetary disturbance. Because the IPS velocity analysis correlates data from all three antennas, the higher sensitivity of the new antenna improves the total sensitivity of the IPS system. More details of the solar wind structure will be studied, and this highly sensitive antenna will bring a possibility of observing pulsars.