Line identifications based on comparison with other well studied SNe are proposed. Opposite to other Type Ic SNe, SN 1990B did not display the He I λ5876 line indicating that its He content was smaller, or that the He layers were effectively yielded from the radioactive matter in the ejecta. The mass-to-energy ratio of SN 1990B, relative to those of other Type Ib/c SNe is computed, both from spectroscopic and photometric criteria, indicating that, for a constant energy deposited by the explosions, the mass in the ejecta of SN 1990B was smaller than those of other slow Ic SN events. Finally, by using two estimates of the foreground reddening, a bolometric light curve of SN 1990B is computed.

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14.04
Evidence for a System of Planets Orbiting Upsilon Andromedae
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Using the Advanced Fiber Optic Echelle (AFOE) spectrograph at SAO's Whipple Observatory, we have monitored the radial velocity of Upsilon Andromedae since September 1994. Similar observations were made by the "HST" team of P. Butler, C. Marcy, D. Fischer, see Paper 14.02. The AFOE data show, in addition to the already known close-in "hot Jupiter" in a 4.6-day circular orbit, two additional companions. The middle companion has a well-defined orbit, with semi-major axis about 0.83 AU, period 243.5 days, eccentricity 0.22, and minimum mass (M sin i) of 2 Jupiter masses. This is in very close agreement with independent findings by the Lick group. The AFOE data alone do not yield well-determined orbital parameters for the outer companions because the total observing span encompasses only about one period of its orbit; however, the data are consistent with parameters derived for that companion by the Lick group from data with a longer time span, and when combined with the Lick data yield a semi-major axis of 2.5 AU, orbital period of 1267 days, eccentricity of 0.41, and minimum mass about 4.6 Jupiter masses. These results, independently obtained by two different groups with different instruments and analysis methodologies, together give strong indications that a true planetary "system" has now been discovered around a star like our own.

We have carried out numerical integrations which show that this system can be stable, but only for certain combinations of periods, masses, and eccentricities of the outer two companions. The stability requirement thus provides a prediction that can be tested as the orbital elements of the outer companion are refined. In addition, it imposes an upper limit on the actual planetary masses, and on the difference in orbital inclination of the two outer planets. Finally, the numerical integrations imply that the longitudes of periastron of the two outer companions are locked to nearly the same value, in accord with the present observations.

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16.18
Chromospheric Magnetic Reconnection and its Possible Relationship to Coronal Heating
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It has been clear since the Skylab era that coronal heating is related to the coronal magnetic field. This may be due to the influence of magnetic field on wave heating mechanisms. It may also be due to "nanoflares," involving magnetic reconnection in the corona, as proposed by Parker and others. It is also possible that reconnection at the chromospheric level may be important. The chromosphere is a favorable site for reconnection, since the resistivity is highest in that region—specifically at the temperature-minimum location. Chromospheric reconnection can lead to coronal heating in several ways including direct Joule heating, the response of the coronal magnetic field to a sudden change in connectivity at the chromospheric level, and the generation and subsequent dissipation of high-frequency Alfvén and magneto-acoustic waves. The last possibility could contribute also to the heating and propulsion of the solar wind, as suggested by Axford and others, since high-frequency waves can be dissipated by cyclotron damping.

We examine some of the processes involved in a scenario for coronal heating which is based on chromospheric reconnection. We also examine a simple analytical model for the random emergence of magnetic elements within supergranulation cells, the convection of these elements into the network, and the cancellation of elements of opposite polarity within the network. This model leads to a prediction concerning the relationship between the mean coronal energy flux and the mean photospheric magnetic flux density for quiet regions. It also leads to an estimate of the rate of injection of chromospheric matter into the corona that may be compared with estimates of the rate of downdraft in the transition region.

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18.05
SPECs: Scientific Objectives and Mission Concepts
H. Moseley (GSFC)

A major goal of modern astrophysics is to understand the processes by which the universe evolved from its initial simplicity, as seen in measurements of the Cosmic Microwave Background (CMB), to the universe we see today, with complex structure on all scales. Major new space missions, like NGST, will open the epoch of structure formation to systematic study. Observations from IRAS showed that much of the luminosity of the universe is emitted in the far infrared. Regions of active star formation, which are important participants in the formation of galaxies, emit much of their luminosity in the far infrared, and dust obscuration prevents detailed optical studies. Measurements by COBE revealed a significant extragalactic background in the submillimeter released by galaxies in this epoch of formation. I will describe the SPECs mission concept. This far infrared and submillimeter interferometer can provide angular resolution and sensitivity comparable to NGST with adequate spectral resolution to allow us definitively determine the history of energy release and structure formation in the universe. The spectroscopic observations with this instrument will allow us to determine physical conditions in early galaxies and provide a detailed history of the formation of the elements.

26.03
Advances in Bayesian applications to astronomy
E.D. Feigelson (Penn State)

Recent years have witnessed a substantial growth in astronomical studies using Bayesian statistics or concepts. Areas of application include image reconstruction, time series analysis of variable sources, object classification, and theoretical astrophysics. These studies are briefly reviewed, along with software systems for Bayesian analysis. We conclude with thoughts on the important successes and future prospects for addressing important astronomical issues using Bayesian methodology.

26.04
Bayesian Analysis of High-Resolution Energy Spectra
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In this paper, we demonstrate how we have employed state-of-the-art Bayesian computational techniques (e.g., Gibbs sampler and Metropolis-Hastings) to analyze low-count, high-resolution astrophysical spectral data. These algorithms are very flexible and can be used to fit models that account for the complex structure in the collection of high-quality spectra and thus can be expected to be applicable to data obtained with future missions. We explicitly model photon arrivals as a Poisson process and, thus, have no difficulty with high resolution low count X-ray and gamma-ray data. These methods will be useful not only for the soon-to-be-launched CXXO and XMM, but also for new generation telescopes such as Constellation-X and GLAST.