(Woltjer, L., *Astrophys. J.* **136**, 1152, 1962) that depolarization is produced by Faraday rotation effects within the radio sources themselves. Sources with high magnetic fields will therefore only exhibit detectable polarization at centimeter wavelengths. At these wavelengths they will have large depolarization rates and consequently large rotation measures due to their internal Faraday rotation. Such sources in contrast to the majority of those studied hitherto will therefore show poor correlation between rotation measure and Galactic latitude and an enhanced correlation with depolarization rate.

This work was done under contract Nonr 220(19).

Light Variations of Certain Cataclysmic Variables. GEORGE S. MUMFORD, *Tufts University*.—The principal new results in this continuing study, which is based on photoelectric observations of various old, recurrent, and dwarf novae obtained primarily at Kitt Peak, are:

- (1) The period of *EM Cygni* is probably nearer 7.00 h than 4.89 h as reported at Tucson;
- (2) The short-cycle oscillations of *SU Ursae Majoris* are not strictly periodic;
- (3) Color curves of *EX Hydrae*, particularly at eclipse, are quite different from those of apparently similar objects;
- (4) There seems to be a phase shift, especially in ultraviolet and visual light, of *U Geminorum's* eclipses at the start of its December 1962 outburst.

This project is being supported by the National Science Foundation.

Far Ultraviolet Spectrometer-Spectroheliometer for the OSO-B Satellite. W. H. PARKINSON AND E. M. REEVES, *Harvard College Observatory*.—A combination spectrometer-spectroheliometer has been designed and constructed by Harvard College Observatory for solar observations in the vacuum ultraviolet region of the spectrum from above the earth's atmosphere. The instrument will be carried in a spacecraft which is scheduled for launch early in 1964. This satellite is very similar to its predecessor, the S-16 satellite and consists of a large wheel rotating about an axis perpendicular to its plane on which the sail of the spacecraft, containing the solar cell array, is mounted. Facility is provided for two experiments to be attached to the sail with solar pointing to the center of the solar disk to an accuracy of ± 1 min of arc. The satellite also possesses the facility for offsetting the direction of pointing, providing a raster scan of a square pattern 40 arc minutes on a side, centered about the solar disk. These two modes of operation may be selected upon command.

The Harvard instrument can record the spectrum

from a selected central portion of the solar disk 1.8 min of arc on the side, over the wavelength region 500–1350 Å. A provision is also included for stopping the spectral scan at a preselected wavelength, and initiating a raster scan of the sun, which can be used to construct spectroheliograms in the radiations of the far ultraviolet. The design and constructional features of the instrument are discussed in some detail, as is the method of calibration. The absolute sensitivity of the instrument has been determined in the laboratory, by separately measuring the reflectances of the platinized imaging telescope mirror and the platinized or gilded grating as a function of wavelength. The photomultiplier of the windowless crossed electric and magnetic field type uses a tungsten photocathode. This detector was calibrated against a piece of tungsten of known photoelectric efficiency. A rocket version of the above instrument was flown on an Aerobee-Hi rocket on 6 September to verify the operation of the instrument and its absolute calibration.

Search for Line Emission from Interstellar OH Radicals. A. A. PENZIAS, *Bell Telephone Laboratories, Inc.*.—A search for 1667-Mc OH line emission from the galactic plane was carried out using a fixed horn-reflector antenna and a multichannel radiometer. The antenna was oriented so that its beam would drift through the galactic plane at longitude 58° and at the anticenter. From a plot of the average of twelve 24-h scans no emission was detected, with sensitivities of 0.05°K and 0.15°K for the two longitudes respectively. (The measurements at the anticenter were less sensitive because of the proximity of the sun to this direction during the period of observations.)

These measurements allow us to place an upper limit of 10^{-7} on n_{OH}/n_H for the regions investigated, provided that the excitation temperature of the transition is much larger than the background temperature.

The principal excitation of this OH transition comes from an interaction between the fields of passing ions and the permanent electric dipole moment of the radical. The cross section for this process, computed from a Fourier analysis of the interaction, is 3×10^{-11} cm² for a particle velocity of 10^5 cm/sec. We obtain an excitation temperature of approximately 50°K from this process, for an ion density of 5×10^{-3} per cm³.

A comparison of our result with recent successful OH absorption measurements indicates that the typical value of the OH excitation temperature is probably closer to 10°K, suggesting that the actual ion density in interstellar clouds is substantially smaller than the generally accepted value employed above.

Interpretation of Abundance Ratios in Heavy Element Stars. VERN L. PETERSON, *Indiana University* (present address: National Bureau of Standards, Boulder).—The mean neutron-capture time during the s process, τ_n , is not known to within several orders of magnitude. By observing a number of atmospheric abundance ratios for a star in which the s process is thought to be operating, and in which the heavy elements formed during the s process are transported to the surface by convection (as may be the case for heavy element stars), it may be possible to estimate τ_n and the core-to-surface transport time as well.

Of the eight isotopes which may have their beta-decay rates inhibited by degeneracy of the electron gas, only one (Os^{191}) may produce observable abundance anomalies at the star's surface. If it is observed that $\tau_n(Sn^{119}) < 10$ yr (Sn^{119} has been taken as the standard), the atmospheric abundance ratio Os/Ir may yield an estimate of the degree of beta-decay inhibition produced by electron degeneracy in the core. This estimate may in turn yield information concerning the temperature and density near the center of the star (Peterson, V. L., and Bahcall, J. N., *Astrophys. J.* **138**, 437, 1963).

Nuclear Interactions of Cosmic Rays as the Source of the Synchrotron Radiating Particles of our Galaxy. J. B. POLLACK AND G. G. FAZIO (introduced by Wm. Liller), *Harvard College Observatory* and *Smithsonian Astrophysical Observatory*.—Presented is a detailed analysis of the production of secondary electrons and positrons in our galactic disk by cosmic rays, in order to determine how well these particles can explain the spectrum and intensity of the meter wavelength radio noise from the halo and disk of our galaxy. Within experimental error the results agree very well with the experimental data, implying that most, if not all, of the radio noise is produced by secondary electrons and positrons. The complete diffusion of relativistic cosmic ray electrons and positrons throughout the galaxy is demonstrated. Information on the magnetic field intensity in the disk and halo is obtained by combining cosmic ray and radio astronomy data. Methods by which the secondary origin of the synchrotron radiating particles can be tested are proposed, and in particular the positron to electron ratio in cosmic rays is predicted as a function of energy.

Streaming Motions in Barred Spiral Galaxies. KEVIN H. PRENDERGAST, *Columbia University*.—A theoretical model of a barred spiral has been constructed under the assumptions that the bar rotates end over end with constant angular velocity, that

the system is in a steady state when viewed from a coordinate system rotating with the bar, and that the gravitational field is not even roughly axisymmetric. Streaming motions occur because the non-axisymmetric gravitational force cannot be balanced by the centrifugal force arising from simple differential rotation.

For the computation of stellar orbits the field of the bar was taken to be that of a uniform prolate spheroid, and a large number of trajectories were integrated numerically. Stars with small initial velocities drift outward along the bar and eventually go off in trailing spiral orbits. Stars with somewhat greater initial velocities tend to become trapped in ring-shaped regions having the bar as a diameter.

The motion of gas cannot be treated by integrating orbits since the pressure must be taken into account. An exact solution of the equations of hydrodynamics has been obtained for the flow in the interior of the bar. The streamlines closely resemble the equipotentials of the combined centrifugal and gravitational fields, and the direction of circulation is the same as the direction of rotation.

Spectroheliograms in the Extreme Ultraviolet. J. D. PURCELL, D. L. GARRETT, AND R. TOUSEY, *E. O. Hulburt Center for Space Research, U. S. Naval Research Laboratory*.—Extreme ultraviolet spectroheliograms were obtained with a simple spectrograph, flown in an Aerobee rocket on 10 May, 28 June (this rocket was furnished by NASA), and 20 September 1963. A single-dispersion spectrograph, using a 40-cm radius of curvature, 2400-line/mm grating was employed with parallel light from the sun to form a spectrum of nearly stigmatic monochromatic solar images covering the region surrounding the normal to the grating. Stray light difficulties were eliminated by the use of a 1000 Å thick aluminum film filter, supported on an 80 per inch mesh of 85% transmittance, placed 6 mm in front of the photographic film.

On one or more flights, reasonably well separated images with resolution of the order of 1' were obtained in $He\ II$, 303.8 Å, $Fe\ xv$ 284.2 Å, $Fe\ xvi$ 335.4 and 360.8 Å, the blend at 257 Å, and also in $Mg\ ix$ 368.1 Å, $He\ I$ 584.3 Å, and $O\ v$ 629.7 Å. Various other images were recorded but with considerable overlapping. Spectroheliograms of a central strip 7' wide were obtained on 10 May 1963 with a double dispersion spectrograph in H -Lyman alpha and beta, $O\ vi$ 1031.9, 1037.6 Å, and $C\ iii$ 977.0 Å.

The $Fe\ xv$ and xvi spectroheliograms show intense emission from plage regions, but none from the disk as a whole. In most of the other lines the