retical evolutionary tracks for stars around one solar mass, using a method similar to that of Henyey *et al.* (*Astrophys. J.* **129**, 628, 1959). For a given mass and composition, the calculations, performed with the IBM 7090 of the University of Toronto, are entirely automatic, including the construction of the hydrogen convection zone on the outside. The age of the old Population I star cluster NGC 188 is found to be between 9 and 10×10^9 yr, under the assumption that $X=0.67$ and $Z=0.03$. Population II stars, for which $Z=0.001$, have an uncertain hydrogen content and calculations were performed for $X=0.999$, $X=0.90$ and $X=0.75$, yielding corresponding ages for the globular clusters M3, M5, M13 between approximately 25×10^9 and 17×10^9 yr.

Neutral Hydrogen near the North Galactic Pole. NANNIELOU H. DIETER, *Air Force Cambridge Research Laboratories and Harvard College Observatory.* —A survey of the 21-cm radiation has been made in the region from the 80° galactic latitude circle to the pole. The observations were made with the Harvard 60-ft antenna and maser receiver at filter bandwidths of 80 kc (17 km/sec) and 15 kc (3 km/sec). Analysis of the data was carried out by fitting Gaussian profiles to the velocity profiles by means of a computer program. The most striking feature of the distribution of neutral hydrogen in this area is its complexity, both with regard to the number of atoms along the line of sight and to the velocities of the clouds. Within this complexity, however, it is clear that there are two principal concentrations—one with a velocity near zero with respect to the local standard of rest and the other with negative velocities ranging from -20 to -50 km/sec. The observations with the narrower filter (15 kc) indicate that within the low velocity component there is a definite correlation between radial velocity and the velocity dispersion within the cloud.

Gamma Ray Spectrum of the Sun. JOSEPH F. DOLAN, *Harvard University, and NASA Institute for Space Studies;* AND G. G. FAZIO, *Smithsonian Astrophysical Observatory and Harvard College Observatory.*—Mechanisms for the production of gamma radiation ($h\nu>10$ keV) by the sun are investigated and fluxes at the earth are predicted. The gamma radiation emitted by the quiet sun is negligible compared to emission during a solar flare. The most important emission mechanism in the 10 keV to 1 MeV energy region is bremsstrahlung by flare-accelerated electrons. The energy spectrum is continuous and decreases monotonically with energy. Flare-accelerated protons will interact with carbon, nitrogen, and oxygen nuclei by inelastic scattering and spallation reactions, producing gamma radiation as a result of nuclear de-excitation. Neutrons resulting from spallation reactions will be partially captured by protons to produce deuterium and 2.23 MeV gamma radiation. The intensity of this line emission is proportional to the neutron density in a flare. Line emission at 0.51 MeV results from positron–electron annihilation. Positrons are produced by beta decay of radioactive nuclei generated by spallation reactions and by the decay of π^+ mesons produced in proton–proton reactions. The primary source of photons with energy greater than 50 MeV is the decay of π° mesons, which are also produced in proton–proton reactions.

Flux estimates indicate that the detection of gamma radiation resulting from a solar flare is feasible and would yield information on nuclear reactions, as well as information on the intensity and spectrum of high-energy protons and electrons.

Composition, Origin, and Structure of Icy Cometary Nuclei. BERTRAM DONN, *Goddard Space Flight Center.*—The composition and structure of icy conglomerate comet nuclei formed by an accumulation process in the primordial solar nebula is examined. In addition to the constituents usually proposed more complex and reactive molecules are expected. A significant proportion of compounds stable only at low temperatures should occur also. The mixture of ices and meteoric matter would form an aggregate with a density of a few-tenths g/cm³. An H_2O–ice nucleus is stable to radii of 10 km. For larger objects compression begins to occur at the center causing the structure of small comets and the outer regions of large comets to differ from that of the interior. Cometary meteor showers suggest that such differences do exist.

Decomposition and reaction among the low-temperature stabilized molecules caused by an increase of temperature may provide an additional energy source for ejecting matter into the coma.

Reactions "frozen" by the rapid density decrease in the coma may account for the observed cometary radicals.

New Spectra of Symbiotic Stars. FRANCOIS V. DOSSON (introduced by Bertram Donn), *Goddard Space Flight Center.*—The spectroscopic observation of symbiotic stars has been extended in two ways; first, by increasing the resolution in the ordinary range of wavelength (3300–5000 Å); second, by extending the spectroscopic investigation to the photographic infrared (6500 to 9000 Å). The best spectra have been obtained for Z Andromedae in