imploding envelopes of these stars hydrogen is exhausted by (p, γ) reactions, the resulting positron emitters decay in a few seconds, and (α, n) reactions produce neutrons from certain resulting nuclei. It has also been suggested that heavy nuclei keep capturing these neutrons until the neutron binding energy falls so low that (n, γ) and (γ, n) reactions have equal rates, the nuclei then waiting until beta decay occurs. Recent computations by the writer show that typical nuclei at such "waiting points" have capture cross sections about 10^{-2} times the cross sections for (n, p) reactions on light proton capture products unstable to positron emission. Protons emitted by the latter reactions cannot be produced in appreciable quantity by this general scheme unless positron decay daughters are also almost always neutron producers and unless such neutron producers are regenerated many times. Until recently it appeared that a cycle of reactions involving C^{12}, N^{13}, and C^{13} nuclei would meet this requirement, but a recent cross section measurement at Oak Ridge has eliminated this possibility, and no other possibility appears to be plausible. It is therefore concluded that the most likely neutron source is an envelope layer in which a small amount of hydrogen has mixed with C^{12} produced in the core and has been exhausted (producing C^{13}) before the explosion. The amount of Cf^{254} synthesized should be sensitive to the initial ratio of hydrogen to carbon abundances. Measurements of the fractional light output in the exponential tails of several Type I supernovae would, therefore, be very valuable.

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Deutsch, A. J. Recent observations of the companion of Mira.

Rapid variations occur in the P-Cygni type Balmer lines, and in a strong shell-type *He* I absorption line at λ3889. The star probably interacts with material ejected from the long-period variable. It may be similar to the nova-like component of AE Aquarii, which shines by accretion of matter expelled from its companion, and to other related degenerate stars in close binary systems. The total mass of the Mira system is low, but both stars are probably in an advanced state of evolution.

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Dieter, Nannielou H. Neutral hydrogen in M33.

Observation of the neutral hydrogen radiation at 21 centimeters from the spiral galaxy M33 has shown that the gas extends far beyond the optical limits of the nebula. This makes it possible to extend the rotation curve derived from emission nebulosities by Mayall and Aller to much greater distances from the center. The curve is consistent with the optical one where it is possible to compare them, but suggests that the velocity does not fall off so rapidly with radius as indicated by the earlier work. This would lead to a larger total mass for the system, of the order of 1.5×10^{10} solar masses. Since the total mass of *H* I observed is 2.4×10^9 solar masses, 16 per cent of the mass of the galaxy exists as interstellar neutral hydrogen.

In addition to the hydrogen following the expected galactic rotation there exists a mass of gas at zero radial velocity relative to the center of M33. This forms an extended source, about 75′ in diameter, with an average total width at half-intensity of 50 km/sec with a mass of 5.2×10^8 solar masses. If the source is spherical, as the shape of the contours indicates, an upper limit for the density of the gas is 0.05 atom per cubic centimeter. This is an upper limit since some of the hydrogen observed at this velocity lies in the plane in positions where the rotational velocity contributes only zero radial velocity components. This distribution resembles the halo proposed by Pickelner and Shklovski.

There is also a quantity of hydrogen at high velocities relative to the center of M33, some of it still farther out than the halo.

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Drake, Frank D. Neutral hydrogen in galactic clusters.

Existing theories of stellar evolution predict that, in a given galactic cluster, all stars of mass less than a certain limiting value will be in the protostar state at present. If these protostars consist of a not too compact structure of neutral hydrogen, they should emit observable 21-centimeter radiation. A successful search for such radiation has been made with the Harvard 60-foot radio telescope. Neutral hydrogen in excess of that present in the general interstellar medium, and coinciding in position and radial velocity with the cluster position and radial velocity, has been found in h and χ Persei,