The Copernicus satellite surveyed the spectral region near Lyman-alpha (Lα) at 1216Å to obtain column densities of interstellar hydrogen toward 100 stars. A définitive value is found for the mean ratio of total neutral hydrogen gas to selective extinction by the dust of 3.8 x 10⁻² atom/cm²-mag. The deviations from this mean value are generally less than a factor of 1.5. The best estimate for the mean total gas density in the solar neighborhood and in the plane of the galaxy is 1.15 atom/cm³; those for the atomic hydrogen and molecular hydrogen alone are 0.06 atom/cm³ and 0.14 molecules/cm³, respectively. [The SC® indicates that this paper has been cited in over 490 publications.]

Interstellar Hydrogen

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One summer evening in 1973 after climbing the Navajo and Arapaho peaks in the front range of the Rocky Mountains, I discussed the day's climbs and then agreed that a good proposal would be to study the atomic hydrogen Lyman line, the most fundamental spectral transition of the most abundant element. This project seemed ideal because of its scientific importance to studies of the interstellar medium, because of my previous experience with the analysis of Ly absorption lines, and because of my software development skills that would be required to solve a stray light contamination problem of the spectra. This proposal was accepted by the Copernicus principal investigator, Ralph Bohlin, and I was a graduate student, and by Ted Stecher, the supervisor at the Goddard Space Flight Center for my new job beginning in the fall of 1973. To solve the stray light problem required two years of hard work and a lot of advice from Don York.

Because of the success of a pilot study for 40 stars, a larger survey was initiated in collaboration with Blair D. Savage, who suggested nearby part of the interstellar hydrogen in the 1050-1100Å range in conjunction with Lα to get the total gas column densities. As part of the study of the interstellar gas in diffuse clouds, and about the total gas abundance required for computing the depletions of the trace heavy elements. The US space program has not offered any launch opportunities for a telescope that can compete with the old Copernicus data for measuring molecular hydrogen. The archives of OAO-2 and OAO-3 data continue to provide valuable supplementary to a large set of UV spectra from the currently operating IUE spacecraft, while Lyman continues to provide scientific importance as well as semiannual collaboration on some challenging rock climbs, even after being officially retired for a few years. The astronomical community is greatly indebted to Lyman for his pioneering work with sounding rocket spectrographs and the OAO program, which were necessary precursors to his efforts in initiating the Hubbell Telescope, which is currently scheduled for launch in December 1989 on the space shuttle.


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