DISTRIBUTION OF PLANETARY NEBULAE PERPENDICULAR TO THE DISK

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From an analytical solution to the Boltzmann-Poisson equations for a thin, vertically isothermal self-gravitating disk with the assumptions that the mass spectrum of stars is expressible as an inverse power-law and the velocity dispersion perpendicular to the plane follows a law of the form $< V_z^2(m) >= V_o^2$ for $m < m*$ and $< V_z^2(m) >= V_o^2(m*/m)^\theta$ for $m \geq m*$, we have obtained a vertical height distribution of planetary nebulae : $n_{PN}(z) = \int_m^{m_u} n(m,z)\tau_{PN}/\tau(m)dm$, where $m_u = 7.0m_\odot$, $m_l = 1.0m_\odot$ and $n(m,z) = n(m,o)\exp(-\phi(z)/ < V_z^2(m) >)$, $\phi(z)$ being the potential at z. Figure 1 shows a normalised height distribution for various values of V_o where we have assumed a Salpeter slope, a $\rho(o) = 0.10M_\odot pc^{-3}$ and set $m* = m_l = 1.0m_\odot$. Figure 2 shows filled circles obtained from the observational sample of Daub (1982, ApJ **260**, 612) superposed on the theoretical distributions. Although there is agreement for large values of z, closer to the plane the observational sample falls below the theoretical curves. Since the observational sample is size-limited, we may be missing a larger fraction of small nebulae closer to the plane. It is also possible a single value of V_o is not a correct representation of reality as these nebulae originate from stars of greatly differing ages and V_o may have changed over the lifetime of the Galactic disk.

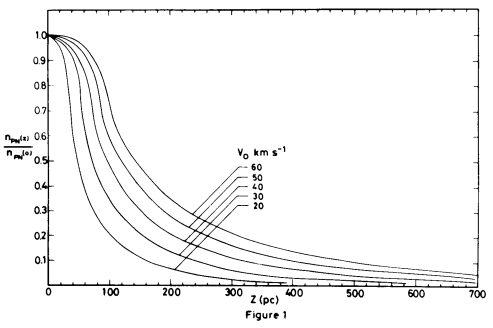

Figure 1

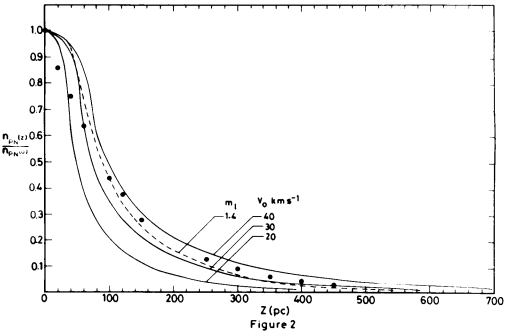

Figure 2

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