THE GEM OB1/IC443/S249 COMPLEX: A CASE HISTORY OF STELLAR EVOLUTION

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The extended cloud complex containing members of the Gem OB1 association, the supernova remnant IC443, and the H II region S249 has been studied with IRAS observations at 12,25,60 and 100 microns and WSRT observations at 327 and 1400 MHz and in the 21-cm H I line. A skeleton-like framework of cool dust delineates the boundaries of the region, and physical parameters have been derived for the entire complex, individual H II regions and the shocked and recombined gas within IC443 using the radio and infrared data. IC443 is shown to consist of three interconnected, roughly spherical subshells of vastly different radii and centroids. The geometry is fully constrained by the structural and kinematic data. Two of the subshells together define the usually assumed boundaries of IC443, while the third includes the optical filaments which extend beyond the northeastern rim and which are shown to have well-correlated nonthermal radio components. The available evidence implies that the SNR shock has encountered a pre-existing high density shell. It is shown that the system of subshells is fully consistent with formation by stellar wind driven bubbles generated by association members within the inhomogeneous environment of the complex.

A NEW THEORY OF STAR FORMATION: ANALYTICAL MASS FUNCTION AND STAR FORMATION RATE

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An analytical, theoretical, time-dependent initial mass function is derived for the objects created in the fragmentation of a gravitationally unstable gas protocloud. The mass spectrum depends on the chemical-dynamical-radiative evolution of the protocloud and it peaks at a mass slightly greater than the minimum Jeans mass attained throughout the evolution. A fragmentation rate mass spectrum is also analytically derived.

By using an evolutionary model presented here, it is shown that the fragmentation process implies the existence of several generations of

https://doi.org/10.1017/S0074180900096170 Published online by Cambridge University Press