

# EINSTEIN OBSERVATORY LIMITS ON NEUTRON STAR SURFACE TEMPERATURES

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ABSTRACT. For years the theoretical models of neutron star formation and evolution had remained largely unconstrained by observation. Following the Einstein X-ray Observatory surveys of supernova remnants and pulsars, however, strict temperature limits were placed on many putative neutron stars. The Einstein search for additional objects in the class of supernova remnants with embedded pulsars has increased the number of such objects by two. For the four objects in this class, the surface temperature limits (see Table 1) provide meaningful logically sound constraints on the neutron star models. For the future, however, still better X-ray observations are needed, both to increase the number of objects available for study and to refine the spatial and spectral capabilities of the X-ray measurements.

TABLE 1  
 Young Pulsars in Supernova Remnants

Object	Period (s)	$\dot{P}$ (s/s)	$E$ ( $10^{38}$ ergs/s)	age ( $10^3$ yr)	$T^a$ ( $10^6$ K)
0531+21 (Crab)	.033	423	4.7	1.24	< 2.5
0540-69	.050	479	1.5	1.67	< 2.5
1509-58	.150	1540	0.18	1.55	< 2.5
0833-45 (Vela)	.089	125	0.071	11.3	~ 1.0

Note a: Surface temperature determination assumed neutron star radius of 10 km, and blackbody emission for observed counts.

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