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Weird Supernovae and Implications for their Progenitor Stars

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In the last decade, systematic surveys of nearby galaxies have discovered thousands of supernovae. A small percentage of these events are extremely peculiar and do not fall into previous categories. These objects have explosions and/or progenitor systems that are significantly different from the majority of supernovae, showing that there are many ways that stars can die. I will discuss some extreme examples, focusing on a relatively large class of peculiar low-luminosity supernovae. The observational properties of this class are difficult to reconcile with current supernova models. With new and upcoming surveys, we will observe hundreds of objects similar to what are currently unique, singular events and will likely discover even rarer types of supernovae.