

Historical evidence for the failure of Occam's Razor in understanding new types of astronomical sources

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I aim to determine what lessons can be learned from historical classification of various classes of transient and variable objects that may help us in classifying and understanding new classes of transient and variable objects. As new windows on the variable and transient Universe have opened up, and continue to open up, with the advent of wide field variability surveys in the optical and radio bands as well as gravitational waves, new classes of astronomical transients have already been found in great numbers, and this trend can be expected to continue. Often when the first member of a new class is explained, astronomers will invoke Occam's Razor and argue that all other members of the class must have the same mechanism. I have looked at some historical examples of new classes of transients, with the main emphasis on discussion of novae and gamma-ray bursts. In both these cases, and several others, multiple mechanisms explain the class as originally defined, and the classes have been broken into multiple subclasses. I will discuss also some cases where a single mechanism has explained a new phenomenon. I then consider the circumstances under which a new class of transients is likely versus unlikely to be broken into many subcategories. As a corollary, I will consider the situation by which many theoretical models to explain transients have been largely correct, but applied to the wrong class of observational data. I will also highlight some of the ways in which AAVSO observers can contribute to helping identify subclasses of transients in the era of large professional variability surveys.