New Horizons in Time-Domain Astronomy
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Light Echoes of Transients and Variables

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Summary. Tycho Brahe's observations of a supernova in 1572 challenged the contemporaneous European view of the cosmos that the celestial realm was unchanging. 439 years later we have once again seen the light that Tycho saw, as some of the light from the 1572 supernova is reflected off dust and is only now reaching Earth. These light echoes, as well as ones detected from other transients and variables, give us a very rare opportunity in astronomy: direct observation of the cause (the supernova explosion) and the effect (the supernova remnant) of the same astronomical event. Furthermore, in some cases we can compare light echoes at different angles around a supernova remnant, and thus investigate possible asymmetry in the supernova explosion. In addition, in cases where the scattering dust is favorably positioned, the geometric distance to the SN remnant can be determined using polarization measurements. These techniques have been successfully applied to various transients in the last decade, and the talk gave an overview of the scientific results and techniques, with a particular focus on the challenges we will face in the current and upcoming wide-field time-domain surveys.

A New Class of Relativistic Outbursts from the Nuclei of Distant Galaxies

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Summary. The recent discovery of the transient source Swift J164449.3+573451 (Swift J1644) has revealed a potentially new class of high-energy outbursts. Like long-duration gamma-ray bursts, these sources exhibit prompt, catastrophic energy release which drives relativistic outflows. However, the central engine powering those events is the supermassive black hole at the centre of a normal galaxy. While not unequivocal, the data can best be explained by the tidal disruption of a star which passes too close to the nuclear black hole, creating an episode of hyper-critical accretion. Motivated by this fascinating discovery, we have searched for new examples that have the necessary properties (luminous X-ray and/or radio, long-lived high-energy emission, evidence for beaming) and have found Swift J2058 (2011 May 18) and PTF 11agg (2011 Jan. 30). The talk discussed the properties of these sources, what may be learned from them in the future, and the detection rate for future transient surveys.

The details which the talk disclosed can be found at
http://adsabs.harvard.edu/abs/2011Sci...333..199L, —/2011Sci...333..203B and —/2011arXiv1107.5307C.
