Recent Advances in X-ray Spectroscopy of Astrophysical Plasmas

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High resolution X-ray spectra provide insight into some of the most extreme physical conditions and energetic processes in the Universe. New results include: the discovery of some of the "missing" baryons in the warm hot intergalactic medium [1]; the inference of collisionless electron heating of the reverse shock in a young supernova remnant [2]; and the accretion-driven physics in a young stellar corona.[3] While these results are exciting, astronomical X-ray spectroscopy is still limited to a few bright sources, with modest spectral resolution and signal-to-noise. Proposed missions in the future will provide new diagnostics for understanding astrophysical plasmas. We will not only find more baryons but complete the metal census of the Universe using soft X-ray absorption lines; use reverberation mapping to localize the source of winds in AGN; and test solar coronal heating models on stars using dielectronic recombination satellites. New capabilities will expand high resolution spectroscopy to extended sources and crowded fields, while also providing velocity resolution down to ~10 km/sec.

References

[1] F. Nicastro et al., Nature, **558**, 406 (2018).
[2] H. Yamaguchi et al., Ap. J., **780**, 136 (2014).
[3] N. Brickhouse et al., Ap. J. Lett., **760**, 21 (2012).