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Zheng Chen* (zheng_chen@brown.edu) and **Chi-Wang Shu**. *Recovering exponential accuracy from collocation point values of smooth functions with end-point singularities.*

Gibbs phenomenon is the particular manner how a global spectral approximation of a piecewise analytic function behaves at the jump discontinuity. The truncated spectral series has large oscillations near the jump, and the overshoot does not decay as the number of terms in the truncated series increases. There is therefore no convergence in the maximum norm, and convergence in smooth regions away from the discontinuity is also slow. A methodology was proposed to completely overcome this difficulty in the context of spectral collocation methods, resulting in the recovery of exponential accuracy from collocation point values of a piecewise analytic function. In this talk, we show how to extend this methodology to handle spectral collocation methods for functions which are analytic in the open interval but have singularities at endpoints. With this extension, we are able to obtain exponential accuracy from collocation point values of such functions. The proof is constructive and uses the Gegenbauer polynomials $C_n^\lambda(x)$. The result implies that the Gibbs phenomenon can be overcome for smooth functions with endpoint singularities. (Received September 09, 2013)