1154-65-325 **Ronald E. Mickens*** (rmickens@cau.edu), Clark Atlanta University, Atlanta, GA 30314, and **Talitha M. Washington** (talitha.washington@howard.edu), Howard University, Washington, DC 20059. *NSFD Schemes: A Methodology for Constructing Structure Preserving Discretizations for Differential Equations.*

The differential equations of most interest for numerical analysis have their genesis in mathematical models of important physical phenomena. However, a major difficulty is the occurrence of numerical instabilities (NIs), i.e., solutions of the numerical schemes not corresponding to any solutions of the differential equations. NIs arise when critical features of the differential equations are not incorporated into the discretizations. The nonstandard finite difference (NSFD) methodology directly deals with these issues. NSFD is based on the concept of "dynamical consistency" and leads to the appearance of denominator functions in the discretization of derivative terms, as well as the requirement that non-local representations be used for the discretization of functions of the dependent variables. A tool for the construction of valid NSFD schemes is the method of sub-equations. We will discuss various issues related to dynamical consistency, denominator functions, and non-local representations, and illustrate the NSFD methodology by using it to discretize to elementary, but nontrivial differential equations. We will conclude with a summary of the successes of the NSFD methodology and present several unresolved issues available for future investigations. (Received August 31, 2019)