This Week’s Citation Classic

[University of Minnesota, Minneapolis, MN]

The method of weighted residuals (MWR) is described and presented in its historical context. The method provides a unifying theme for several diverse methods for solving differential equations. The relationship of the Galerkin method1 with variational methods is outlined. (The SCi® indicates that this paper has been explicitly cited in about 100 publications, making it the most-cited paper published in this journal.)

Bruce A. Finlayson
Department of Chemical Engineering
University of Washington
Seattle, WA 98195

September 1, 1983

“This publication originated during my graduate student days. Despite drawbacks like financial stringency, graduate study has benefits as well, like the possibility to focus on one issue and to read in the library at leisure (almost!). I was blessed with excellent library facilities at the University of Minnesota: open stacks and extensive holdings. The method of weighted residuals (MWR) had developed over a period of 50 years, and I needed to read the original papers; fortunately, the dusty volumes were there. If I had to resort to interlibrary loan, this paper would never have been published! While studying these dusty volumes, it was clear there was a unity in, and relationship between, the various methods used for approximating solutions to differential equations. The material was finally summarized as a chapter in my thesis.

“Careful comparison revealed that methods advanced by Biot2 and Prigogine3 were only disguised applications of the Galerkin method. This cleared the decks for the emergence of the finite element method,4 which fleshes out the details only alluded to in the article. Probably another reason the article is cited is that it is much cheaper than the book! A consulting job that resulted from the cited article led to solution methods which have since been written in still another book. The career impact of the cited article continues to this day.”