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Discussion

Comments by the book's editor on the review of 'Selected topics in vibrational mechanics'

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The review to which this discussion refers [1] is evidently based on a different understanding of the term 'vibrational mechanics' from that intended by the present author in his book [2]. The theory of nonlinear vibrations, in particular, is a much more general subject than Ref. [2] addresses. The term 'vibrational mechanics' has been defined in the present author's earlier book [3] as 'mechanics for an observer who notices neither fast forces nor fast motions'. The review [1] mentions vibrational mechanics as an area whose advances have been recognized by 'glittering prizes'; but the more specialized topic addressed in Refs. [2,3] has not received such general recognition.

A point not apparent from the review is that the method of direct separation of motions, which is the main (though not the only) applicable method of vibrational mechanics, differs significantly in its application from the method of multiple scales. It also differs from the perturbation and asymptotic methods in their original form. The method of direct separation of motions is significantly easier to use and is more physically transparent at each step. It is meant, however, to apply to a relatively narrow class of problems, namely the problems of vibrational action on non-linear mechanical systems where the exciting and resulting motions consist of a fast and a slow component. In addition to the idea of separation of the motions via averaging, this method is based on the premise that throughout the mathematical procedure the governing equations keep their fundamental mechanical form as given by Newton's second law. Therefore, the review's reference to the book by Kevorkian and Cole [4] is somewhat inappropriate as the latter is devoted to classical perturbation methods. The method of direct separation of motions is described not only in the book [3] cited above, but also in the books by Thomsen [5], Fidlin [6], and also in a number of Russian books and textbooks.

Although it is not mentioned in Ref. [1], the methodology of 'vibrational mechanics' and of direct separation of motions that is the topic of the book [2] has been successfully used to model many experimentally observed phenomena. For example, an explanation is given for the paradox associated with Chelomei's pendulum and for the effect of the well-known 'Indian magic rope'. The fundamentals of the

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vibrojet effect and conjugate resonances are examined, and a number of extremely simple solutions are given to both new and well-known mechanical problems.

Furthermore, this methodology has been developed specifically as a toolbox for engineers. The present author feels it is inappropriate to compare his book with standard texts on perturbation methods, as is done in the last sentence of Ref. [1]; while the remark that most of the chapters of the book "[contain] virtually no reference to experiments" is perhaps misleading, since in a number of places in the book, references to data are provided for both numerical and physical experiments.

It is necessary to agree with the reviewer concerning inaccuracy in translation and also editorial inaccuracy. I present my apologies to the readers for these errors, which are very distressing for me.

In summary, the author wishes to emphasize that the book [2] is not intended as a reiteration of perturbation methods in the theory of nonlinear vibrations. Rather, it exemplifies the broad applicability and robustness of the approach of 'vibrational mechanics' in general, and the method of direct separation of motions in particular, for solving a specified class of problems in nonlinear vibration.

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