

Preface

This book is devoted to an account of theories of heat conduction where the temperature may travel as a wave with a finite speed. This area of non-classical diffusion is very topical in the research literature. With the advent of micro-scale technology there is increasing evidence that thermal motion is via a wave mechanism as opposed to by diffusion. We survey many of the theories which have been proposed as candidates to describe thermal motion as a wave. These theories are linked to solid mechanics (elasticity) and also to fluid mechanics.

Wave motion in the form of acceleration waves and of shock waves is discussed. An exposition of numerical work in the area of thermal waves is also included. Analytical methods for establishing uniqueness, continuous dependence, growth, spatial decay and other results are described.

Two important chapters are the final two. These focus firstly on where nanofluids and heat transfer are relevant. Hyperbolic temperature equations have been linked to the recent and “hot” area of nanofluids. The final chapter investigates applications of “heat wave - like” ideas to other areas, particularly those in mathematical biology are also investigated.

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Durham

Brian Straughan

Heat Waves

straughan, b.

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