Contents

Contributors Preface vii ix

1

Geometrical and Catastrophe Optics Methods in Scattering

PHILIP L. MARSTON

INTRODUCTION AND OVERVIEW	2
INTRODUCTION TO GEOMETRICAL AND PHYSICAL OPTICS	
Methods Relevant to Scattering	5
CAUSTICS AND ASSOCIATED DIFFRACTION CATASTROPHES	52
WAVES TRANSMITTED THROUGH FLUID AND ELASTIC SCATTERERS	
AND GLORY SCATTERING	148
SURFACE RAY REPRESENTATIONS OF SCATTERING BY SHELLS AND	
Other Smooth Objects	205
Acknowledgments	220
Appendix: Polar and Cartesian Expressions for Principal	220
Curvatures	220
References	221
	INTRODUCTION AND OVERVIEW INTRODUCTION TO GEOMETRICAL AND PHYSICAL OPTICS METHODS RELEVANT TO SCATTERING CAUSTICS AND ASSOCIATED DIFFRACTION CATASTROPHES WAVES TRANSMITTED THROUGH FLUID AND ELASTIC SCATTERERS AND GLORY SCATTERING SURFACE RAY REPRESENTATIONS OF SCATTERING BY SHELLS AND OTHER SMOOTH OBJECTS ACKNOWLEDGMENTS APPENDIX: POLAR AND CARTESIAN EXPRESSIONS FOR PRINCIPAL CURVATURES REFERENCES

2

Scattering of Sound Pulses and the Ringing of Target Resonances

SUSAN K. NUMRICH AND HERBERT ÜBERALL

1.	INTRODUCTION	235
2.	THEORY OF THE SCATTERING OF SOUND PULSES FROM	
	IMPENETRABLE OBJECTS	239

v

Contents

3	THEORY OF THE SCATTERING OF SOUND PULSES FROM FLASTIC	
5.	OBJECTS	247
4	EARLY EXPERIMENTS WITH SOUND PULSES SCATTERED BY	
	ELASTIC OBJECTS	257
5.	TARGET RESONANCES AND THE SINGULARITY EXPANSION	
	Method	264
6.	THEORY OF SURFACE WAVE PULSES, THE RINGING OF	
	RESONANCES, AND THE DETERMINATION OF THE EIGENFREQUENCY	
	SPECTRUM OF ELASTIC SCATTERERS	275
7.	Development and Use of Experimental Methods	301
	References	313

vi

Subject Index	319
CONTENTS OF VOLUMES IN THIS SERIES	325