MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The RESEARCH LABORATORY *of* ELECTRONICS

PROGRESS REPORT

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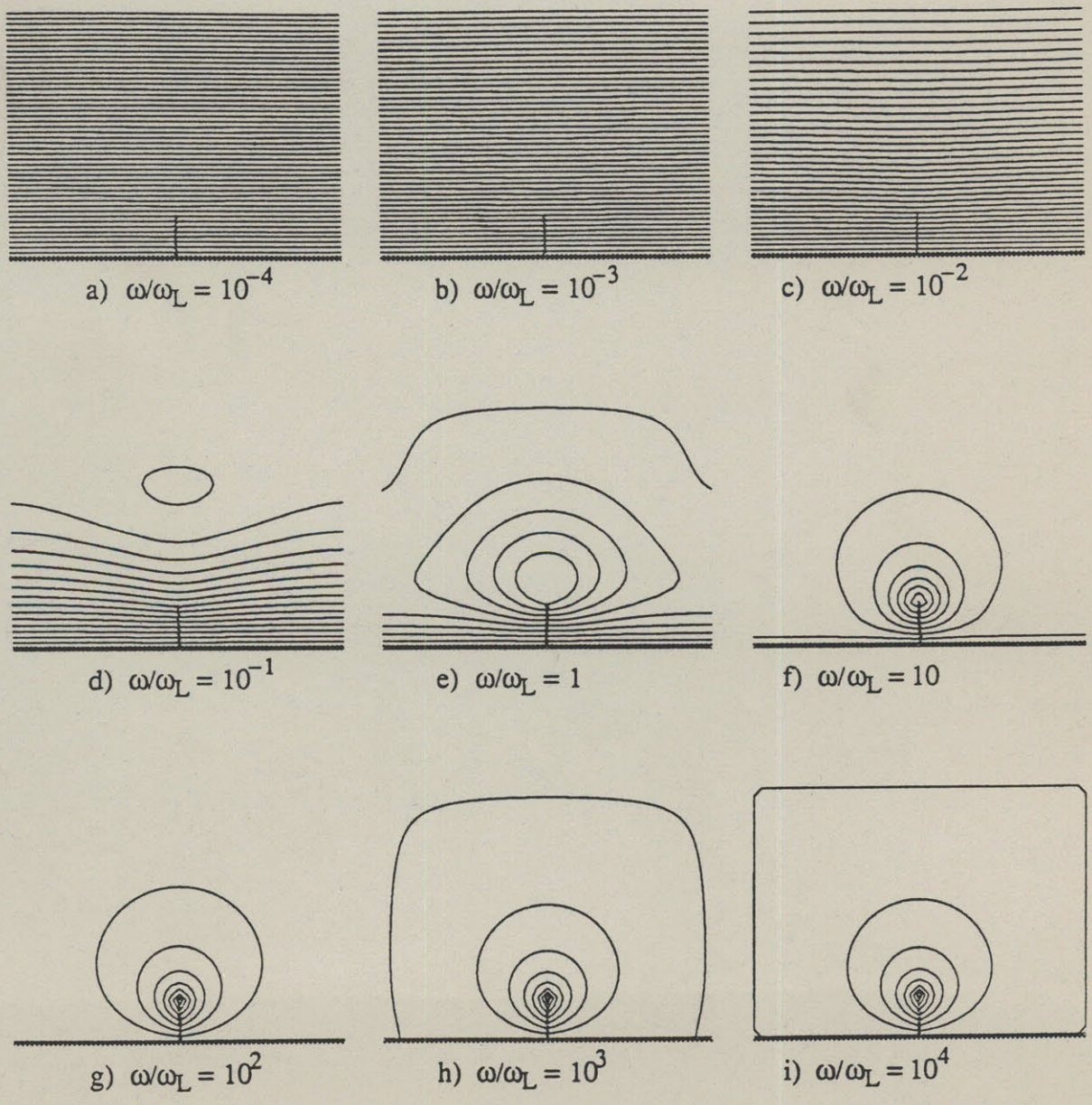

a) $\omega/\omega_L = 10^{-4}$

b) $\omega/\omega_L = 10^{-3}$

c) $\omega/\omega_L = 10^{-2}$

d) $\omega/\omega_L = 10^{-1}$

e) $\omega/\omega_L = 1$

f) $\omega/\omega_L = 10$

g) $\omega/\omega_L = 10^{2}$

h) $\omega/\omega_L = 10^{3}$

i) $\omega/\omega_L = 10^{4}$

Massachusetts Institute of Technology

RESEARCH LABORATORY OF ELECTRONICS

RLE PROGRESS REPORT No. 128

January 1986

Submitted by: J. Allen
R. Birgeneau

Cover: The mechanically sensitive cells (hair cells) of the fluid-filled inner ear contain microscopic sensory hairs that vibrate when the ear is stimulated by sound. This vibration is transduced by the hair cells to produce activity in nerve fibers which carry the information about the sound stimulus to the brain. The mechanisms underlying the coding of sounds into nerve messages are currently under investigation in RLE (see section 18.1.3., p.101).

The figure on the cover illustrates results from a computational study of simple structures vibrating in fluid; a study designed to determine the effects of fluids on the vibration of the sensory hairs of hair cells. The fluid motion that is induced by sinusoidal translation of a rigid structure (that consists of an infinite flat plate from which a rectangular flap projects) is illustrated by streamlines (drawn parallel to the direction of fluid motion with a density that is proportional to the magnitude of fluid velocity). Each panel illustrates the numerical solution of the equations of motion of the fluid for a particular frequency of vibration; lowest frequency in the upper left panel and highest frequency in the lower right panel.

Freeman, D.M., "Hydrodynamic Study of Stereociliary Tuft Motion in Hair Cell Organs," Ph.D. Thesis, Department of Electrical Engineering and Computer Science, M.I.T., May 1986.

This report No. 128 in a series of Progress Reports issued by the Research Laboratory of Electronics, contains the annual statement of research objectives and summary of research for each group. The report covers the period January 1, 1985–December 31, 1985, and the source of support is indicated for each project. On the masthead of each section are listed the academic and research staff and the graduate students who participated in the work of the group during the year. The listing of personnel in the back of the book includes only members of the laboratory during 1985.

List of Figures