Studies in music psychobiology [43.63.Rf]—Scott Makeig, *Music Psycholobiology, University of California at San Diego, La Jolla, California, January 1985 (Ph.D).* A technique is developed which uses the electrophysiological response evoked by steady-state auditory stimulation at rates circa 40 Hz (the *auditory high-rates response*) to continuously probe the auditory nervous system. The response is found to be depressed in sleep, and may be suppressed by sounds introduced into the ear contralateral to that receiving the probe stimulus. *Minute rhythms* in the response are described, quasirhythmic amplitude and phase modulations with periods between ½ and 2 min. These also occur in visual and tactile high-rates responses. Correlations between minute rhythms in responses to multiple concurrent stimulus streams at multiple scalp sites are found to vary across time and subjects. During drowsiness, correlations between concurrent minute rhythms in the response, ongoing EEG frequencies, and vigilance performance may become strongly coupled. A complex analog (CERP) of the event-related potential (ERP) is defined, and its use explored in an experiment averaging responses to occasional omitted stimuli in a high-rates probe train, producing a well-defined CERP (series of modulations in response amplitude and phase) lasting at least 600 ms.

Thesis Advisors: Dr. Robert Galambos, Gerald Balzano, Dr. Arnold Mandell.
Copies available from: University Microfilms, Ann Arbor, Michigan.

Active sound attenuation using adaptive digital signal processing techniques [43.50.Gf, 43.60.Gk]—Larry John Ericksson, *University of Wisconsin-Madison, Department of Electrical and Computer Engineering, Madison, WI 53706, August 1985 (Ph.D.).* Active attenuation systems for the reduction of acoustic noise using adaptive digital signal processing techniques are analyzed. Problems associated with acoustic feedback, error path and auxiliary path transfer functions, transducer responses, and model order are discussed in detail. System identification concepts are used to discuss the problem. Observability considerations are used to analyze the potential of several adaptive filter configurations for use in active attenuation systems. Several new approaches are presented to overcome the problems of acoustic feedback as well as correct for error path and auxiliary path transfer functions. Compensation techniques for transducer modeling are described. The effects of complex accoustical plants and reflections on model requirements are analyzed. Performance results for a complete hardware system based on the TMS 32010 microprocessor are presented for attenuation of a variety of noise sources. Directions for future work in the areas of algorithms, transducers, and processors are discussed.

Thesis Advisor: Richard A. Greiner.

Critical analysis of the Ritz method in the case of natural boundary conditions and solution of some structural dynamics problems [43.40.At]—Ricardo O. Grossi, *Universidad Nacional del Sur, Bahía, Blanca, Argentina (D. Eng.).* As stated by A. W. Leissa "confusion exists in the minds of some regarding the necessity of the trial functions to satisfy all the boundary conditions of the problem when using the Ritz method." In the first part of the present thesis the author attempts to clarify this matter essentially when the edges of beams and plates are elastically restrained against translation and rotation. An exhaustive analysis of the problem is made making use of Hilbert and Sobolev's spaces. The second part of the thesis deals with the solution of some basic structural dynamics problems using the "extended" Rayleigh–Schmidt approach whereby several exponential optimization parameters are used to minimize the frequency coefficients. It is believed that some of the conclusions and approaches presented in this work may be of interest to researchers in other fields of engineering and applied science.

Thesis Advisor: Dr. Patricio A. A. Laura.

Note: A limited amount of copies of the thesis is available upon written request to the author (Institute of Applied Mechanics, Puerto Belgrano Naval Base, 8111-Argentina).

Analytical and experimental investigation on vibrating, continuous beams and plates [43.40.At]—Liberto Ercoli, *Universidad Nacional del Sur, Bahía Blanca, Argentina (D. Eng.).* The present work deals with the approximate, analytical solution of certain vibrations problems of continuous beams and plates. It is shown that use of polynomial coordinate functions and a variational approach such as Ritz method leads to very good engineering approximations from the point of view of finding some of the lower natural frequencies which correspond to transverse vibration modes. Several complicating factors such as elastically mounted masses, plates with cutouts, the effect of elastically restrained edges, etc. are also taken into account. It is shown that good agreement exists with results already available in the literature for the cases already considered by other investigators. On the other hand, it is proved that the eigenvalues improve considerably if the Rayleigh–Schmidt criterion is used. Finally an experimental investigation is also conducted showing reasonably good agreement with the analytical predictions.

Thesis Advisor: Dr. Patricio A. A. Laura.

Note: A limited amount of copies of the thesis is available upon written request to the author. (Institute of Applied Mechanics, Puerto Belgrano Naval Base, 8111-Argentina).

Studies of acoustical fields generated by vibrating structures with applications to noise control by design [43.50.Gf, 43.40.Qi]—Jiann-Kuo Jiang, *Department of Mechanical Engineering, Stevens Institute of Technology, Castle Point Station, Hoboken, NJ, May 1985 (Ph.D.).* A machinery noise control effort can generally be classified as noise control at the source, along the path, and at the receiver. It is known that noise control at the source is usually the most desirable but difficult approach. In a machine, vibrating structural components form one of the major sources of noise. This thesis reports the theoretical and experimental studies on the acoustical fields due to various types of vibrating structures with applications to noise control (at the source) by design. Vibrating structures considered in the studies are piston type and beam type. The theoretical work is based on the boundary element method which can effectively deal with the boundary value problems especially associated with an infinite domain. The experiments were conducted in an anechoic chamber. The studies are intended to obtain a better understanding of the influence of structural design parameters on the acoustical near and farfield. The studies have shown that design parameters such as structural geometries, discontinuities, and boundary effects for a given vibration response have considerable influence on the acoustical fields. The studies have yielded some new observations in the applications of the boundary element method and in its engineering application to noise control by design.

Thesis Advisor: Dr. M. G. Prasad.

Studies on the acoustic pressure and complex acoustic intensity fields of two interfering monopoles [43.85.Fm, 43.20.Fn]—Sang Young Ham, *Department of Mechanical Engineering, Stevens Institute of Technology, Castle Point Station, Hoboken, NJ, May 1985 (M. E.).* The acoustic intensity method is being increasingly used for sound power evaluation, source identification, and ranking, etc. The interference between various source components in a complex machinery is an important factor which influences the applications of intensity method. The study deals with the complex acoustic intensity and acoustic pressure fields of two interfering point monopoles. The theoretical work includes the interference analysis of multiple point monopoles in addition to the case of two sources. The experimental work deals with acoustical pressure field measurement. The tests were conducted in an anechoic chamber. In addition to the interference studies of pressure and intensity fields, they are related using an interference ratio (I_R/p_R^2) of normalized intensity ($I_R = I_{12}/I_1$) to the normalized pressure field ($p_R^2 = p_{12}^2/p_1^2$). An interference index (L_x) in a given direction of measurement which is equal to difference between $(L_I - L_p)_c$ of the combined field to $(L_I - L_p)_p$ of the primary field has been introduced. The studies have shown that the analysis and measurement of the interference of intensity and pressure fields will be very useful in the application of acoustic intensity methods to machinery noise problems.

Thesis Advisor: Dr. M. G. Prasad.