Studio Report
The Bregman Electronic Music Studio at Dartmouth College
and
The M.A. Program in Electro-Acoustic Music

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The Graduate Program at Dartmouth
The Dartmouth College Master's Program in Electro-Acoustic Music
is a two-year interdisciplinary degree program dedicated to work that explores
the interrelationships among music, technology, cognitive and computer science, acoustics, and
other related disciplines. We have tried to maintain, in the studio and in the graduate
program, strong research and compositional components, and to eschew the integration of the
two. Typically, the program includes between three and five first-year and three and five
second-year students.

Students are encouraged to develop their individual goals. While in the program their work
may be directed toward creative, research, theoretical or technical projects. We have been
interested in students who want to help redefine the future of music and technology. The
program is now in its seventh year, and has graduated about 20 students, who are now pursuing
careers in academia, the arts, and music technology.

Course requirements for the degree include five seminars in music and technology and courses
in psychology, acoustics, computer science and engineering. In the second year, students complete
a master's thesis, which may consist of software, research, hardware, or composition. (See
below for a list of the master's theses topics so far).

Faculty include Jon Appleton (Director of the Graduate Program), Charles Dodge, Larry
Polansky (Co-Director of the Studio), Jamshed Bharucha (Psychology Department), and
Michael Sturge (Physics Department). Faculty from other departments and the Thayer School
of Engineering frequently participate in classes, thesis committees, and research projects.
Kristine Burns will be a visiting faculty for 1996-7.
Once a year the graduate program and studio host the Dartmouth Annual Music Industry Conference, at the Minary Center on Squam Lake in scenic northern New Hampshire. This conference has been a fertile environment for people in the music technology industry to exchange new ideas and initiate collaborations, and is attended by Dartmouth graduate students and faculty as well.

The Combination of Art and Technology
Combining the study of music and science is difficult. Although many scientists are musicians they tend not to be musically sophisticated, and conservatory-trained musicians can sometimes be technophobia. In one sense, the purpose of our graduate program is to fill musical or technological gaps in graduate students with either technical or musical backgrounds. Some of our technically oriented students compose music for the first time in their lives when they get here. Similarly, we want to work with musicians who are naturally curious about technology, and who feel comfortable with — if not secure in their knowledge of — computers. This might include those musicians who are interested, for example, in music cognition.

In the six years our program has been in existence we have observed an explosive growth in the music industry’s need for people with training in both music and science, and who are able to combine their fields of expertise. Consequently, those of our graduates who do not pursue further study at the PhD level are often employed writing new music software, designing new musical instruments, working with audio applications in the health sciences, designing new musical applications for the entertainment industry and pursuing careers as composers. Our program works best when we can find musicians and scientists willing to inspire and assist each other.

Electro-Acoustic Composition, Research and Graduate Study at Dartmouth
A basic tenet of the Graduate Program in Electroacoustic Music at Dartmouth is that the practice of composition affords great, valuable insights into the nature of electroacoustic music. Composition study in Dartmouth’s program is formalized by the requirement to take, in each of the two years of the program, a seminar in the study and practice of the composition of electro-acoustic music. We find that the active practice of composition informs the work of our students with a comprehension of the field, even for those without previous experience, that greatly enhances their work.

The graduate program students and faculty present a concert of their work each term, and frequently host other groups and graduate students in concerts of electro-acoustic music. Recent guests have included the ACREQ composers from Montreal, and the graduate students from the MusKitchen at Rensselaer Polytechnic Institute. The students and faculty have also presented concerts of their work as a group at a number of other places, including Montreal, RPI and Mobius in Boston. Every spring, Dartmouth’s Hopkins Center for the Performing Arts hosts its annual Festival of New Musics, which includes works by students in the program, and guest electro-acoustic composers and performers.

Computer music research is the second main component of graduate study at Dartmouth. Students whose background is primarily composition are encouraged to gain as much experience as possible in software, music cognition, audio engineering, DSP and the scientific and mathematical tools of computer music. Theses topics have reflected the essentially synergistic nature of the program: about half have been compositions, about half have been research (presently software) projects. A number of projects have consisted of sophisticated and
innovative Macintosh applications for DSP experimentation. Several have focused on the use of the Lemur/MQ spectral representation format as a fundamental tool, partially as a result of the strong emphasis placed on the integration of ideas from music cognition in the curriculum here.

The Bregman Electronic Music Studio

Historically, the Bregman Electronic Music Studio at Dartmouth has been an important center for innovation in electro-acoustic and computer music. For about 15 years, the Synclavier (developed in part at Dartmouth) was the focus of the studio. Beginning in around 1990, the Bregman studio also began focuses in both Unix and Macintosh based composition and research platforms. That dual commitment is reflected in the current studio configuration.

The Bregman Electronic Music Studio is a fully equipped computer music facility occupying its own building on the Dartmouth campus. In addition to faculty offices, a seminar room, and graduate student working areas, there are four main studios: a Macintosh workstation room, a digital audio workstation room, a MIDI studio, and a NeXTstation room. Though these rooms have specific focuses, they all have capabilities for synthesis, digital editing, recording, MIDI, and programming. All machines are linked via ethernet, and file access is relatively transparent across the various platforms and studios.

The Macintosh workstation room is oriented to Macintosh interface programming, composition and synthesis, and consists of a number of powerful Macintoshes with full audio capability, processing gear, and digital recording equipment. In addition, this studio contains a Sun computer which is used for research and programming, and is part of Dartmouth Project Nethstar, a campus-wide computing project. The digital audio workstation room has a fully equipped ProTools system, a large mixer, a number of processors, video equipment, and a Fostex Foundation workstation. The MIDI studio has a full complement of MIDI synthesizers and controllers, a powerful Macintosh with full digital sound capabilities, and a number of software packages. The NeXTstation room has a NeXT computer and audio equipment, and also houses student-owned NeXT machines. It is used for programming and composition, and serves as the studio ftp site and web server. In addition, a large studio-wide file server is housed in this room for backup and sound storage for students and faculty. The Bregman studio has been greatly aided in recent years by a large Dartmouth-wide equipment grant from the Seny Corporation of America, which has greatly enriched the audio capabilities of the Bregman Studio.

Recent visitors, guest researchers, lecturers, visiting faculty and composers to the studio have included: Jean-Claude Risset (France), Jame Tenney (York University), Carla Scaletti (Symbolic Sounds, Kathryn Vaughan (MIT), Ron Kuivila (Wesleyan University), Richard Lerman (Arizona State University West), Ben Niel (The Kitchen, NYC), Nic Collins (STEIM, The Netherlands), Dan Oppenhein (IBM Research), Kody Fitz (CERL), Tom Erbe (California Institute of the Arts), Lars Gunes Bodin (Sweden), Max V. Mathews (Stanford), Andre Smirnov (Russia), Rond Fig I C R de Souza (Brazil), Juan Blanco (Cuba), David Evan Jones (UCSC), Christian Calos (France), Francis Dhomont (Quebec), Robert Normandieu (Quebec), Paul Lansky (Princeton), Brad Carton (Columbia), Dmitri Pukhovskv (Russia), George Todd (Middlebury).

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Graduate Thesis Topics, 1991-1996

1996
"Wavelet analysis and processing of audio signals in C++ on the SGI Indy platform" by Corey Cheng
"A Live Interactive Composition for Flute, Mandolin, and Computer" by Timothy Polashek
"A Plug-In Time-Varying Filter for Deck II" by Martin Dupras

1995
"Direct Manipulation of MPEG Compressed Digital Audio" by M. Alexander Broadhead
"A Theoretical Model of Timbre Perception Based on Morphological Representations of Time-Varying Spectra" by Christopher Langmead
"Forging Elements: Electro-Acoustic Sound Art" by Kenneth E. Overton
"Conversations, an electro-acoustic composition" by Frana Perez

1994
"QuickMQ: A Software Tool for the Modification of Time-Varying Spectrum Analysis Files" by Stephen Berkley
"Using Physical Modeling Synthesis to Produce Realistic Timbres" by Courtney Kennedy
"Transformation of Audio Signals by Use of the McAulay-Quatieri Sinusoidal Model of Sound" by Theodore Apel
"Experimental Filter Design Using Neural Networks for Sound Generation" by John Puterbaugh
"Masters Integrating the Shakuhachi with Electronic Sound" by Kojiro Tomesaki

1992
"HS: A Symbolic Programming Language for Computer Assisted Composition" by Michael Casey
"Vocali, an electro-acoustic composition by Raymond Guillante

1991
"Rethinking the design of wind controllers" by Gerald Beauregard
"Applications of Wavelets in Music: The Wavelet Function Library by Clifton Kussmaul
"Mutation Synthesis" by Martin McKinney