

CCRMA Studio Report

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Center for Computer Research in Music and Acoustics(CCRMA),
Stanford University

1. The place and the people

The Stanford Center for Computer Research in Music and Acoustics (CCRMA) is a multi-disciplinary facility where composers and researchers work together using computer-based technology both as an artistic medium and as a research tool. CCRMA is located on the Stanford University campus in a building that was refurbished in 1986 to meet its unique needs. The facility includes a large quadraphonic experimental space with adjoining control room/all digital studio, a recording studio with adjoining control room, a MIDI-based small systems studio, a general purpose analog/digital studio, several work areas with workstations, synthesizers and speakers, a seminar room, a reference library, classrooms and offices.

For a detailed tour and more information feel free to visit us in the World Wide Web:

- <http://ccrma-www.stanford.edu/>

The CCRMA community consists of administrative and technical staff, faculty, research associates, graduate research assistants, graduate and undergraduate students, visiting scholars and composers, and industrial associates. Departments actively represented at CCRMA include Music, Electrical Engineering, Mechanical Engineering, Computer Science, and Psychology. CCRMA has developed close ties with the Center for Computer Assisted Research in the Humanities (CCARH), recently affiliated with the Department of Music.

Staff & Faculty: **Chris Chafe**-Associate Professor of Music, Director; **Jay Kadis**-Audio Engineer/Lecturer; **Fernando Lopez-Lezcano**-Systems Administrator/Lecturer; **Heidi Kugler**-Secretary; **Max Mathews**-Professor of Music (Research); **Jonathan Berger**-Associate Professor of Music; **Julius Smith**-Associate Professor of Music and Electrical Engineering; **John Chowning**-Professor of Music, Emeritus; **Leland Smith**-Professor of Music, Emeritus; **John Pierce**-Visiting Professor of Music, Emeritus; **Jonathan Harvey**-Professor of Music; **David Soley**-Assistant Professor of Music; **Eleanor Selfridge-Field**-Consulting Professor of Music; **Walter Hewlett**-Consulting Professor of Music; **William Schottstaedt**-Research Associate; **Dan Levitin**, Lecturer; **Marina Bossi**; Lecturer.

2. The activities

Center activities include academic courses, seminars, small interest group meetings, spring and summer workshops, and colloquia. Concerts of computer music are presented several times each year including an annual outdoor computer music festival in July. In-house technical reports and recordings are available, and public demonstrations of ongoing work at CCRMA are held periodically.

Research results are published and presented at professional meetings, international conferences and in established journals including the Computer Music Journal, Journal of the Audio Engineering Society, and the Journal of the Acoustical Society of America. Compositions are presented in new music festivals and radio broadcasts throughout the world and have been recorded on cassette, LP, and compact disk.

3. The environment

The computing environment currently supported includes Macintosh computers and several flavors of unix-based workstations. The old and trusty network of NeXT computers has been augmented by two new supported hardware and software platforms. High powered Pentium and PentiumPro PC's are running both NEXTSTEP and Linux, the last one a fairly recent addition to the supported operating systems list. A couple of SGI machines running Irix complete the current setup. Several servers offer shared resources that are available in all platforms, an Ethernet network being the glue that ties everything together and connects CCRMA to the rest of the Internet. Supported software in the unix world includes the CCRMA Lisp Environment (which includes Common Music, Common Lisp Music and Common Music Notation), the MusicKit and associated programs (in NEXTSTEP only) and tons of utilities and packages for research and music creation. The Macintosh world has a full complement of MIDI based tools and is mostly used for MIDI applications, notation and digital mixing (with hardware assist from Dyaxis II and ProTools systems in two of the studios).

MIDI-based systems include Yamaha, Roland and Korg equipment including Yamaha DX, TX, SY, TG and VL

synthesizers, KX88 keyboard controller, Disklaviers, Korg WaveStations and Wavedrum, E-mu samplers and digital delays and reverberation. Also available are IVL pitch trackers, a Buchla Lightning MIDI controller, several Mathews Radio Drum controllers, MIDI patchers and drum machines from Yamaha and Roland.

Studio recording equipment includes a 24 track mixer, an 8 track TEAC analog recorder, a Yamaha DMR8 digital recorder and mixing console, several TEAC 8 track digital recorders, various signal processing devices, Westlake monitor speakers and an assortment of high quality microphones.

4. The research

This array of brief research summaries will give you an idea of the current crop of research at CCRMA and who's doing it:

Computer Music Hardware and Software:

- “PadMaster, an Interactive Performance Environment. Algorithms and Alternative Controllers” - **Fernando Lopez Lezcano**
- “Common Lisp Music and Common Music Notation”, “The *snd* Sound Editor” - **William Schottstaedt**
- “The CCRMA Music Kit and DSP Tools Distribution” - **David Jaffe** and **Julius Smith**

Physical Modeling and Digital Signal Processing:

- “Flaring Bores” - **Dave Berners**
- “Reducing Numerical Computation in Struck String Physical Models” - **Stephan Bilbao**
- “Simple but powerful extensions to sample playback synthesis” - **Nicky Hind**
- “Oversampled Representations for Audio Parameter Estimation” - **Scott Levine**
- “ATS (Analysis, Transformation, Synthesis): source/filter (subtractive) algorithm and harmonic partials tracker design” - **Juan Carlos Pampin**
- String and wind synthesis, course development, filter design, numerous collaborations, First Tesseract CD finished and available (<http://www.till.com/tesseract/>) - **Julius Smith, Assoc. Prof. Music and EE**
- Reducing aliasing in Virtual Analog synthesis, and applying control-systems techniques to acoustics and physical modelling - **Tim Stilson**
- Physical modeling and non-linear acoustics - **Laurent Daudet** and **Julius Smith**
- “An Acoustic Analysis of Single-Reed Woodwind Instruments with an Emphasis on Design and Perform-

mance Issues and Digital Waveguide Modeling Techniques” - **Gary Scavone**

- “Transient Modeling Synthesis: a flexible analysis/synthesis tool for transient signals” - **Tony S. Verma, Scott N. Levine, Teresa H.Y. Meng**

Controllers for Computers and Musical Instruments:

- “The Hummer Project: Developing a MIDI controller for people with disabilities” - **Andrew Einaudi, Neil Scott**
- “Improvisation program on the radio-baton” - **Max Mathews**
- “THE FUZZY MOOSE: A Haptic Tool for Tracking the performance of Fuzzy Classifiers in real-time” - **Sile O'Modhrain**
- “Virtual violin human-computer interface” - **Charles Nichols**
- “Solo Acoustic Guitar Music Reproduced on a Real-time Controller: Creating a Better General Keyboard Controller” - **Jonathan Norton**

Psychoacoustics and Cognitive Psychology:

- “Denoising and Reductionism: Signal Analysis and High Level Reductive Analysis of Music” - **Jonathan Berger**
- “A Theory of Musical Expectation” - **Jonathan Berger**
- “Connected to What?” (Cognition in Music Theory) (SMT Plenary - 1997) - **Jonathan Berger**
- “A Neural Network Model of Metric Perception and Cognition in the Audition of Functional Tonal Music” - **Jonathan Berger** and **Dan Gang**
- “Statistical Pattern Recognition for Prediction of Solo Piano Performance” - **Chris Chafe**
- “Skill Development in Classroom Harmony and Keyboard Harmony: Breadth-First vs. Depth-First Learning” - **Paul von Hippel**
- “The Case for a Sequencer that Teaches Dictation Skills: Curricular and Flexibility Shortcomings of Existing Products” - **Paul von Hippel**
- “Impact of MIDI and MIDI Equipment on Electroacoustic Art Music” - **Alex Igoudin**
- “Automatic Pronunciation Scoring of Specific Phone Segments in Speech” - **Yoon Kim**
- “Composition and Collage: Morton Subotnick's *The Key to Songs*” - **Leigh VanHandel**

Computer Music and Humanities:

- “On Collaborations, Documents and Talking to a TV, Paper for the 1997 Symposium on Science / Art - Internet / Multi Media” - **Chris Chafe**
- “Musical Acoustics Research Library updates” - **Gary Scavone**
- “Ethnomusicological research in South America and report on the state of music technology in Chile and Argentina” - **Jane Rivera**

5. The music

Two CD's - “Computer Music @ CCRMA, Volume One” and “Computer Music @ CCRMA, Volume Two” - have been edited at CCRMA, in what is expected will be a continuing series representing the musical production of the center. Feel free to visit our web site for more details (<http://www-ccrma.stanford.edu/>).

Some of the recent (during this past year) compositional works realized at CCRMA:

- **Celso Aguiar** (DMA Graduate Student) - *All blue, I write with a blue pencil, on a blue sky*, for quad & stereo playback, *Sextet*, for flute, clarinet, percussion, piano, violin, cello.
- **Jonathan Berger** (Associate Professor of Music)- *The Voice Within a Hammer* (1), for flute, clarinet (Bb), violin, viola, piano and computer (ICMC 97), *The Voice Within a Hammer* (2), for flute, clarinet (Bb), mallet percussion, contrabass piano and computer, *Concerto for Piano and Orchestra*.
- **Joanne D. Carey** (Visiting Composer) - worked on improvisation programs in C for the Radio-baton for a piece in progress for Flute and Radio-baton.
- **Kui Dong** (Visiting Composer, China) - *Youlan: Long Winding Valley*, for stereo tape.
- **Janet Dunbar** (DMA Graduate Student) - *Song of the Shaman*, for performance poet, soprano, percussionist and stereo tape.
- **Gerald Eckert** (Visiting Composer, Germany) - Currently working on a tape piece, with a motet of Josquin Deprez as the basic sound material and structural meaning, “*Nen*” for clarinet solo, “*wie Wolken um die Zeiten legt*” for small ensemble, “*l'etendue des fins eclats, eparse*” for violin solo.
- **Jonathan Harvey** (Professor of Music)- **Juan Pampin** (PhD Graduate Student) (**collaboration**) - *Rumi* (tentative title), for choir and electronic sounds.
- **Nicky Hind** (DMA Graduate Student) *COSMOS*, for live electronics - using analog and FM synthesizers, and sampler, controlled by MAX and the radio baton.
- **Jun Kim** (DMA Graduate Student) - *ZephyrBells*, for quadraphonic sound, *DREAMING* for viola and computer-generated tape, *Reverberation*, for two sopranos, percussion, tape and five candlelights.
- **David Jaffe** (Visiting Composer / Researcher) - *The Seven Wonders of the Ancient World*, for Mathews/Boie Radio Drum-controlled Disklavier, mandolin, guitar, harp, harpsichord, harmonium, contrabass and 2 percussionists; Radio-Drum part is performed by Andrew Schloss, who also helped develop and refine it.
- **Tobias Kunze** (DMA Graduate Student) - "Protozoo, interactive sound installation".
- **Peer Landa** (Visiting Composer / Norway) - *Gag Order* (compact disk) This piece was commissioned by NoTAM for the GRM Acousmonium. The material is derived solely from three old native Japanese instruments and then rigidly processed by custom made DSP-applications. *Downcast* for tape using original C-based software.
- **Bobby Lombardi** (DMA Graduate Student) - performance of “*do you love me?*” for percussion narrator and tape, currently working on “*all you need*” for solo tape.
- **Fernando Lopez Lezcano** (System Administrator / Lecturer)- *With Room to Grow*, for PadMaster, Radio Drum, and MIDI instruments; *House of Mirrors* for PadMaster, Radio Drum, midi instruments and sound-file playback.
- **Charles Nichols** (PhD Graduate Student) - *interpose*, for guitar and computer generated tape.
- **Jonathan Norton** (PhD Graduate Student) - *Snapshots on a Circle* - for alto sax, cello, percussion and tape.
- **Juan Pampin** (PhD Graduate Student)- *Metal Hurlant*, for metallic percussion and electronic sounds, *Reverberation*, for two sopranos, percussion and computer processed sounds on tape.
- **Fiammetta Pasi** (Visiting Composer / Italy) - *Collage*, for stereo tape, *Quimeras*, for stereo tape.
- **Andre Serre** (Visiting Composer, France) work in progress for cello and four channel tape.
- **Kotaka Suzuki** (DMA Graduate Student)- *Eclipse*, for stereo tape and dance.
- **Marco Trevisani** (Visiting Composer / Italy) *Variazioni e Frammenti su Aura*, a Bruno Maderna inspired tape composition. Aura is an Orchestra piece written by Bruno Maderna in 1971. Signal processing, using CLM (Common Lisp Music)